

IN THIS ISSUE—WOMEN IN INDUSTRY

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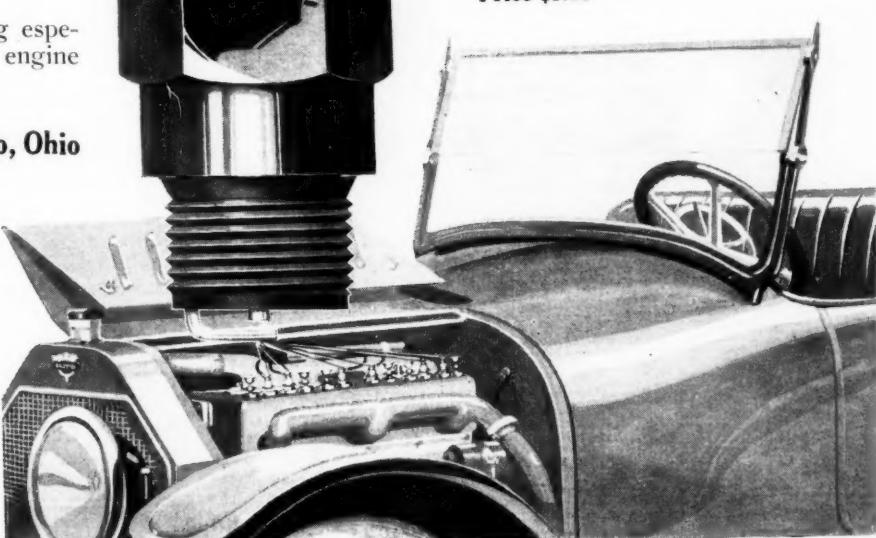


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The AUTOMOBILE and Automotive Industries

VOL. XXXVII

NEW YORK—THURSDAY, SEPTEMBER 27, 1917—CHICAGO

No. 13

Female Labor's Place in Automotive Industry

Great Increase of Women in Industry Anticipated.
England Has Increased Efficiency by Shortening Hours.
Employers Must See Women Workers Are Properly Fed.

By Allen Sinsheimer

IN July, 1914, 5,020,000 women were engaged in gainful occupations in the United Kingdom. In April, 1916, the number increased to 5,490,000. This was a gain of 470,000 during twenty-one months of war—five times the normal peace time increase which for such a period would have been about 94,830.

In the United States in 1900 5,319,397 women were engaged in gainful occupations. In 1910 the number was 8,075,772—and it is reasonable to estimate that 11,000,000 women are working in this country today. Consequently, if the United States devotes as much man power to warfare within the next two years as the United Kingdom, there will be more than 2,000,000 women now new to industry engaged in it.

Many New Problems

This condition will create many problems peculiar to female labor, and involving:

Illiteracy and lack of knowledge of English.

Hours of labor.

Rates of wages and earnings.

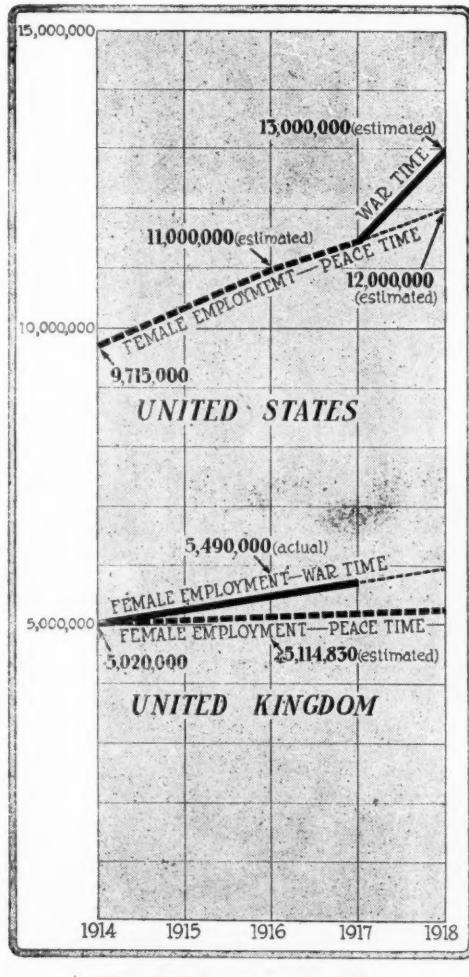
Efficiency of female labor.

Labor conditions affecting health.

Housing and safety.

Industrial canteens.

Rest rooms and matrons.



State legislation affecting female labor.

The feminine temperament.

Employment of mothers.

Time keeping and labor turnover.

Physical capacity.

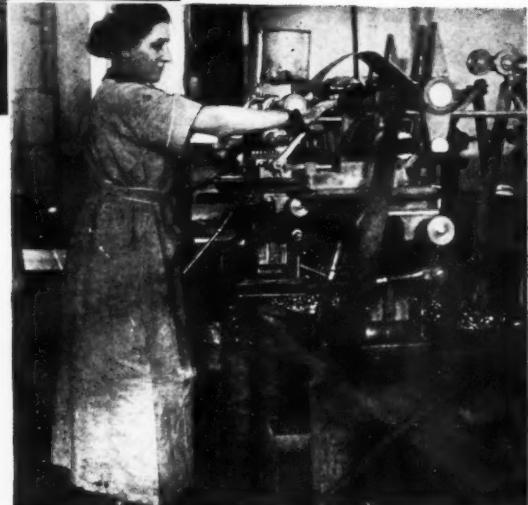
Knowledge of English Aids Production

It is generally understood that illiteracy or unfamiliarity with the English language creates inefficiency, exorbitant accident compensation and discontented workers. The Ford Motor Co. recognizing these evils among its male workers, inaugurated the Ford Melting Pot, a school designed to instruct the foreign employees in regard to American institutions and in the English language. The results show a decrease of 54 per cent in the number of accidents, an increase in production and the disappearance of interpreters and their cost. Female labor, unaccustomed to work, will be found even more liable to accidents and prone to inefficiency because of ignorance of the English language. Where illiterate female workers, and particularly those who have never before engaged in gainful occupation, are employed, the plan followed by D. E. Sicher & Co., New York City, manufacturers, and employers of women, will be found profitable. The Sicher plan aims "to hasten

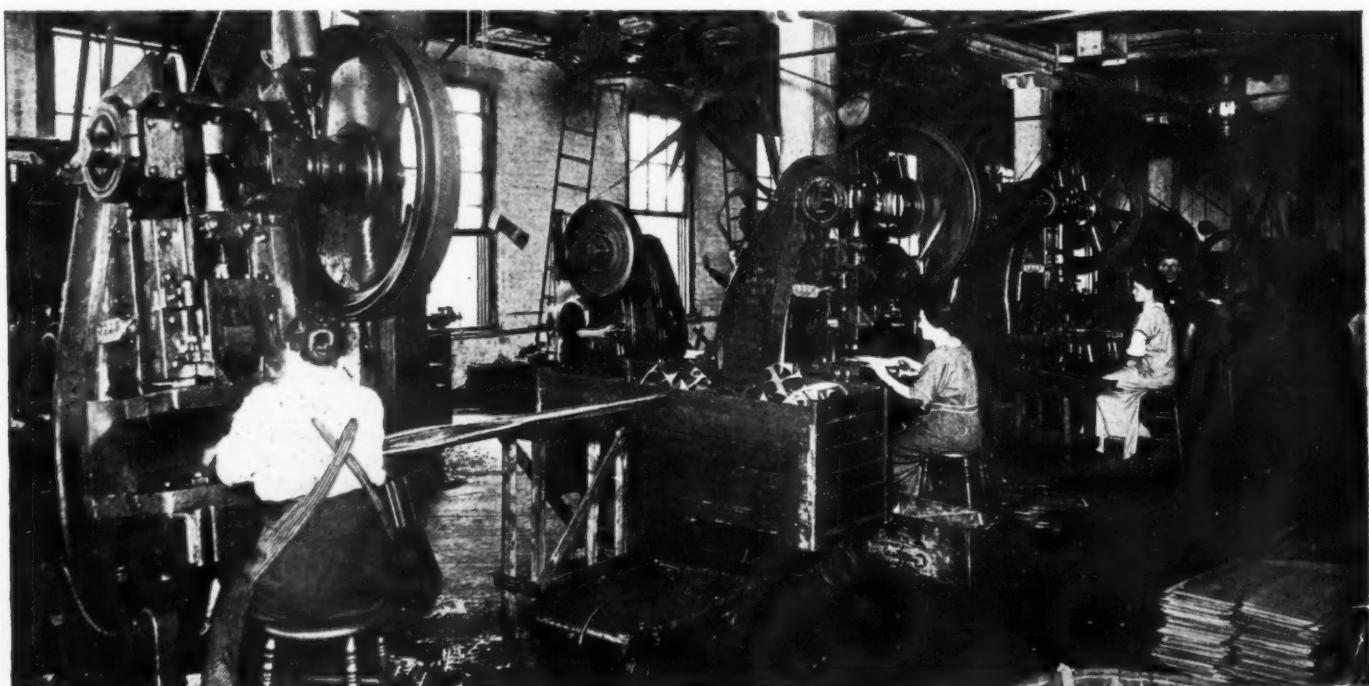


Left—The Chalmers Motor Co. top department, where women operate efficiently at sewing machines

Below—Women have been found able to run bolt threading machines at the Chalmers plant



In Chalmers factory. Left—Assembling small parts. Center—A small parts inspector



Girls operate light machinery which shapes the sheet brass used in Maxwell radiators at the Maxwell Motor Co.'s plant

assimilation necessary to national unity; to promote industrial betterment by reducing the friction caused by failure to comprehend directions and to decrease waste and loss that always mark the presence of the illiterate worker."

The plan includes a school incorporated with the daily work, where three-quarters of an hour of daily instruction is given without interruption in factory work. The average foreigner is transformed into a literate American woman with a good mental equipment and social knowledge in thirty-five weeks. The school has the co-operation of the Board of Education. The teacher in attendance was formerly a public school instructress and was selected for the work by the principal of a school in the heart of the foreign section of New York City. The school room is set aside in a quiet out-of-the-way corner of the factory. The curriculum includes naturalization, history, civics, geography, study of New York City, health and safety, library work, newspaper work, business ethics, business letters, friendly letters, language and arithmetic.

The total cost of thirty-five weeks' instruction per girl is \$16.80 for the firm and \$14.80 for the city. It was found that for thirty-two weeks preceding the opening of the school the wages of the girls who later became pupils averaged 19.5 cents per hour, while that of the literate girls was 23.2 cents per hour. After four weeks of instruction the girls taking the course increased their earning capacity to 20.9 cents per hour. After sixteen weeks of school attendance the same girls increased their earning capacity to 22.2 cents per hour. The cost of operating this school to the Sicher firm for a thirty-five weeks term is:

Wages to workers while learning at rate of 17 cents per hour.....	\$3.57
Floor space rental.....	175
Light, heat, and so forth.....	105
Janitor service.....	35
 Total.....	 \$672
Average cost per girl, \$16.80.	

Cost to the Board of Education was:

Teacher's salary, books, pencils, papers, etc.....	\$560
Average cost per girl, \$14.80.	

Hours of Labor Regulated

Hours of labor for female workers are regulated by laws in the various States and the laws differ according to legislation. In the State of Michigan night work is prohibited from 6 P. M. to 6 A. M. in factories, mills, work shops, etc., and weekly hours of labor are limited to fifty-four hours, which is on a ten-hours-per-day basis. Ohio has regulations prohibiting night work for female labor in factories, work shops, and so forth, from 6 P. M. to 6 A. M., and has a fifty-four-hour weekly limit, based on ten hours per day. Indiana limits night work in all institutions from 10 P. M. to 6 A. M., but has no stipulation limiting the number of hours a girl may work per week.

In England, where night shifts have been operated constantly because of the concentrated effort devoted to production, women have been working in factories in night and day shifts—the majority of plants using the two-shift system and a few the three-shift. Hours of labor vary from fifty to sixty weekly. Night shifts are shorter than day shifts, and as a rule are forty-eight hours per week. There is no Sunday work for women in the majority of plants. It was found in several institutions that women were unreliable for night shift work and in many instances reported late or were reported absent. Because of the difficulty of sleeping by day and digesting food by night in alternating shifts, it has been found more efficient to allow the women on night shifts to remain so continuously for some months at a time.

Investigations reveal that the eight-hour night shift is

preferable to a longer period and that the last hours of the twelve-hour night shift yield little output because of low vitality and industrial fatigue. More hours of actual work are available each day when the eight-hour shift is operated than with the twelve-hour shift. It is probable that employers forced to concentrate effort and energy on munitions orders will find short hour shifts advantageous. Experiments in this country with male labor have proved this to be correct. The Miller Rubber Co. at Akron, Ohio, experimenting by reducing the hours of labor from 10 to 8 per day discovered that female labor earnings of 16.4 cents per hour increased to 21.5 per hour in six months, that production increased from 82 per cent to 107 per cent, and attendance by 10 per cent in the same period.

Rates of Wages Vary

Weekly salaries in the United States are generally placed at a minimum of \$8 per week, but this is a matter which can best be determined by localities. Girls living away from their homes and in the Southern States have been found able to live on \$8 per week. The Minnesota minimum wage commission found that girls in Minneapolis and St. Paul living away from home and in reputable districts had to pay \$8.52 per week to purchase the very necessities of life. A canvass of employers of female labor asking what wages they receive as compared with male salaries resulted in the following replies:

1. A large motor car factory employing 200 women in the factory says it is necessary to pay them 30 per cent less than the male salary.

2. An automobile parts maker pays his 350 women employees 20 per cent less than the male standard.

3. A large wholesale hardware company employing several hundred women pays 20 per cent less than the male standard.

4. A large implement company pays 33 1-3 per cent less.

5. A clothing manufacturer employing 2,000 women pays the same piece rates for men and women and pays 25 to 20 per cent less than the male standard to female employees on a weekly salary scale.

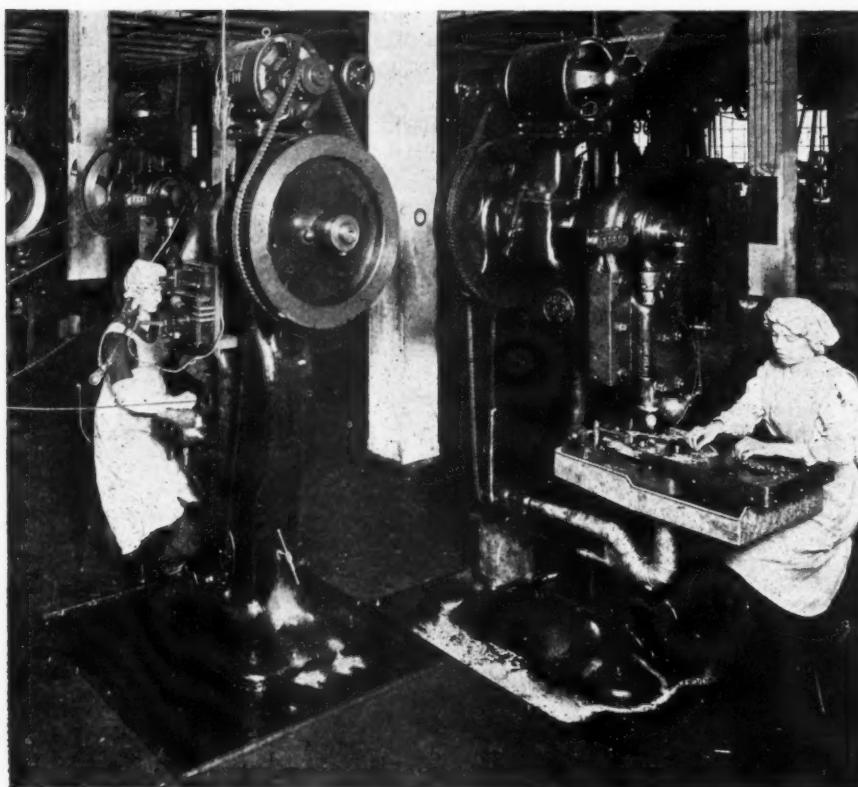
6. A large mail order concern employing 4,000 women for factory and clerical work pays them the same per unit of product as the male workers.

Four other large employers answered the query by stating that they were paying female workers the same as men.

In England the wage rate for women is controlled by a Government order under the munitions act. The standard cost of living there, of course, differs from that in the United States and the scales cannot therefore be compared. The rates as dictated by the Government are a minimum weekly wage of \$4.87, whether by salary, time or piece rate, with overtime at time and a half, all excess over fifty-four hours per week being regarded as overtime. The women working in the shell factories on time rates and piece rates earn between \$14.60 and \$24.33 per week. In the engineering shops the earnings average \$7.30 per week.

Piece Rate Gaining Favor

Piece rate payment for earnings is rapidly finding favor in this country among women workers and employers of women, and recently the time study plan for setting piece rates is being introduced. The Dayton Engineering Co., Dayton, Ohio, has inaugurated the time study plan for setting piece rates and finds it more fair to employer and employees than the try-out system. It has proved to be more just, simple and accurate. The



Operating presses in the Link Belt Co. factory

former method of rate setting allowed a try-out man to perform the work operations and to set a rate for piece work as a result of his experience. Under the new system the operators themselves perform the work which forms a basis for price making. When a price is to be set on piece work an operator using the usual equipment performs her labor while a rate man, studying with a stop-watch, times the operation. These experiments extend over a sufficient time to insure fair price setting. The rate set is consequently for the benefit of the average operator, but insures fairness to all. A woman above

average benefits accordingly and the inexperienced girl is given a guaranteed day rate. The company observes the following rules in connection with this method of rate setting:

1. All piece work wages are made in direct proportion to the number of good parts produced.
2. No price is cut within one year from the day of try-out for any reason, excepting a change in material, tools or process.
3. A change in the speed or feed of a machine will not be the basis for a reduction.
4. Prices may be advanced when good reason can be shown for such action.

Efficiency of Female Labor Good

Inquiry among the manufacturers of the United States shows that female labor applied to certain light machine work and to work where dexterity of hand is required is more productive than male labor. The Link Belt Co., Indianapolis, finds women more efficient and productive when assembling small links into chains and handling packing for heat treating purposes than the men. The Chalmers Motor Co., Hibbard, Spencer, Bartlett & Co., the International Harvester Co., Hart Schaffner & Marx, American Gentleman Factory, shoe manufacturers, and the Westinghouse Electric & Manufacturing Co. find that female labor applied to light machine work produces more effectively than male labor. One manufacturer finds that women at machine work require more supervision than men, because when a machine breaks down they are unable to repair it and look for some one else to fix it. Another employer finds an additional need for supervisors, because the women are unable to handle the large and heavy output resulting from their productive efforts. Several employers find



Chain assembly completely handled by female labor in Link Belt Co. factory



The Dayton Engineering Laboratories employs girls for making sub-assemblies and small finished assemblies

that though their female employees do not work as effectively as men, they are as productive in comparison to salaries paid.

Attain Proficiency Quickly

In the employment of women who have never before had experience with factory work, it should be remembered that where simple labor is concerned they will quickly become proficient, and that in the case of work on automatic machines where technical skill is subordinate to attention, carefulness and dexterity, they may also be expected to soon attain a fair level of proficiency—these being the results discovered in the English factories. Where skilled work is essential the English factories have up to this time been unable to secure efficient production from female labor, but this may be due to the fact that these employees have been engaged in this work for less than two years and consequently are apprentices in the same degree as male labor under the same conditions would be.

Conditions of labor affecting health are of particular importance where female workers are employed. Sanitary wash rooms and cloak rooms are essential. Chairs should be provided for workers wherever this is possible. Provision for meals should allow three quarters of an hour to an hour and the interval between meals should not exceed four hours.

Housing a Manufacturer's Problem

Demand in the automobile and parts factories in Michigan, Ohio and Indiana for female labor will result in an influx of women from all parts of the country and no doubt create a considerable demand for lodgings. This may to some extent be balanced by the number of men who will join the armies, but it is particularly important for the efficiency of the factory organization that the employer through some appointed supervisor arrange for lodging accommodations for all female

workers. This can be done by the erection of a club-plan lodging house or the maintenance of a list of reputable lodging houses in the vicinity of the factory. Manufacturers considering the employment of many women might erect a hotel similar to the Hotel Irvin in New York City. This institution, in which no men except porters or janitors are employed, has found it possible to maintain itself upon the following scale:

(a) Room rent, 55 to 71 cents per day, with the privilege of sharing rooms with other girls to reduce the rent to as low as 28 cents per day.

(b) Meals served in the restaurant of the hotel at cost, which includes the cost of preparation.

Safety Measures

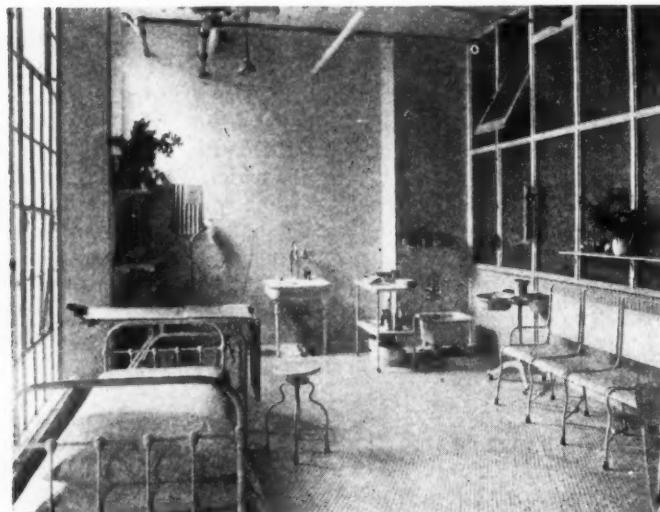
Many companies find that they reduce accident compensation and inaugurate an efficient "safety first" system by installing machinery which requires the use of both hands for each operation whenever it is possible. Female labor responds quickly to education of "safety first" principles when it is literate and able to com-



The hand-screw department at the Dayton Engineering Laboratories



One of several rest rooms for girls at the Dayton Engineering Laboratories. Girls visit these rooms whenever ill or tired and can secure recreation in the form of music or books during a short rest period



The first-aid room for girl workers at the Dayton plant

hend the instructions. In factories it has been found that a woman's peril comes, first, from lack of familiarity with machinery, and second, from the automatism which is established by the worker who is attendant on a machine. Several employers of female labor in the United States, in addition to safeguarding the machinery, have inaugurated bulletin boards and "safety first" pamphlets for the prevention of accidents, and have found these methods efficient.

Canteens Increase Output

Factory workers, and particularly female labor, like the soldiers, require good rations to enable them to do good work. Cold foods are inadequate and hot foods secured at nearby restaurants are often unappetizing and lack nourishment, and the industrial canteen as inaugurated by the English factories is now regarded as an important production factor. On an average women require about four-fifths of the food supply of a man and can be provided with food in factory restaurants similar to those installed in some of our American factories or the English industrial canteens, at very low cost. The average English canteen considers cleanliness, warming (55 to 60 deg. Fahr.), lighting and ventilation. It includes ample dining room space with separate accommo-

dations for men and women, and kitchens provided with the necessary scullery, pantry and store rooms. In addition, in the English canteen there is accommodation for the employee who prefers to bring her own food to warm or cook.

Following is the average cost of food for a dinner in an English canteen:

	Cents
Meat or fish with two vegetables.....	8.1 to 16.2
Meat pies and other prepared meat or egg dishes.....	4.1 to 8.1
Soup, bovril, etc., with bread.....	2 to 4.1
Puddings and stewed fruits.....	2 to 4.1
Suet, bread, currant jam and fruit pudding.....	2 to 4.1
Bread and cheese.....	2 to 4.1
Cakes, sandwiches, bread and butter.....	2 to 4.1
Tea, coffee, cocoa or milk.....	1 to 3

The English canteens serve meals by three methods:

1. Long serving counters from which the workers carry their food.

2. Food placed ready on tables before workers are admitted. This is a convenient plan for breakfasts or tea, but is not practicable for hot dinners.

3. Waiters or waitresses organize in shifts or volunteer with small payment for services rendered.

An English law prohibits employers from deducting for food or drink. Various methods of payment are in vogue in the canteen, including payment by bill or check, or by the sale of books or series of tickets, previous to the meal or at the exit door. English makers have found that the success of the industrial canteen depends upon its management, and are utilizing three systems of operation. In some instances the employer manages, in others the workers appoint a management committee and in still others the management is contracted out to a caterer. The most successful management exists where joint control is exercised by the employer and an elected shop committee with a chairman.

What the Canteen Has Accomplished

The results of the industrial canteen in England include a marked improvement in the health and physical conditions of the workers, a reduction in sickness, less absence and broken time, and increased efficiency and output. (A complete description of the instruction of the English industrial canteen is on file in the Detroit office of THE AUTOMOBILE AND AUTOMOTIVE INDUSTRIES and copy will be forwarded to any manufacturer interested.)

One of the first remarks made by Alfred Kauffman, vice-president of the Link Belt Co., when discussing female labor, was: "One thing important and to be remembered is this: If a plant is going to put on many women employees it must provide proper facilities for taking care of them, such as rest rooms and matrons." Care must be taken in the selection of the matron. She should have a genuine love for girls and be methodical and business-like. It is her duty to keep in touch with all of the female labor. They must feel that she is their friend. Each must secure just treatment and the matron, if she is sympathetic and experienced in welfare, can be made a clearing house for complaints and grievances which frequently tend to decrease production. Rest rooms are essential. Female labor being of a different temperament and physical construction than male labor, is unable to withstand the steady drain upon the constitution produced by uniform and constant machine work and requires opportunity for rest upon occasions. Employers in the United States who have inaugurated rest rooms find that ten minutes' leisure once or twice a day increases female workers' productive ability. Rest rooms can be installed at small expense. They should be easily accessible from the factory shops, and must be sound proof. Furnishings can be provided by the installation of comfortable chairs and couches, and entertainment and attractiveness can be included by adding a

phonograph, a few flowers and canaries in cages.

State legislation affecting female labor must be given careful consideration, else employers will find themselves inadvertently conflicting with the law. Legislation has been enacted in every state of the Union to regulate the employment of women in respect to hours of labor and night work and to regulate the number of hours for the employment of girls under sixteen. Laws in many states specify the provision of seats, separate lavatories, minimum wages, mothers' pensions and prohibition of employment of prospective mothers.

Temperament Affects Production

The temperament of female labor affects production. Women are less inclined to become laboring machines than men. Sensitive girls engaged by rough tempered foremen and placed at work without instruction and without encouragement in a shop filled with strangers cannot work to the best advantage. In some American factories employers have a plan by which the girl new to factory work is first introduced to her companions in the shop and is given instructions and an opportunity to feel at home before she is placed at her work. Female supervisors are more efficient than men when handling female labor, because of their ability to gain the workers' confidence, to learn their grievances, to determine home troubles, or to discover any factors which prevent her from attaining a normal productive output.

Employment of mothers has proved satisfactory where provision is made for care of the children, but is very unsatisfactory where the mother, feeling that her home or children are neglected, is unable to devote her attention completely to her work.

Time Keeping Under Control

The question, "Are women absent from work more frequently than men?" was asked of twenty different large employers of women in the United States. Four answered in the negative and sixteen in the affirmative. One company that employs a number of nurses to call upon absentee workers states that three-fourths of the calls are made upon women, although the proportion of women employed is considerably less than 75 per cent. Another employer states that single women are not absent more than men, but that there is a great degree of absence among married female workers. The absence is attributed to sickness to which women are more prone than men.

In answer to the question, "Do women change their positions more often than men?" the replies were unanimously in the negative. One employer answered, "Most women dread looking for good positions. Sometimes they leave positions on account of marriage or through private conditions which require their presence at home, but these causes for leaving are more than offset by the tendency of men to look for better positions."

Another employer states that at the beginning of operation in a factory, employers will discover a large turnover rate between female workers, which will gradually decrease with time. This, he states, is due to the fact that girls often take factory positions and later discover that they

do not like the work, and the large turnover prevailing at the beginning of a factory is due to the fact that, never having done factory work before, they leave shortly after starting. One large concern, after experiencing considerable labor turnover, first with men and then with boys, in the summer months, experimented with women and found an important reduction in the percentage.

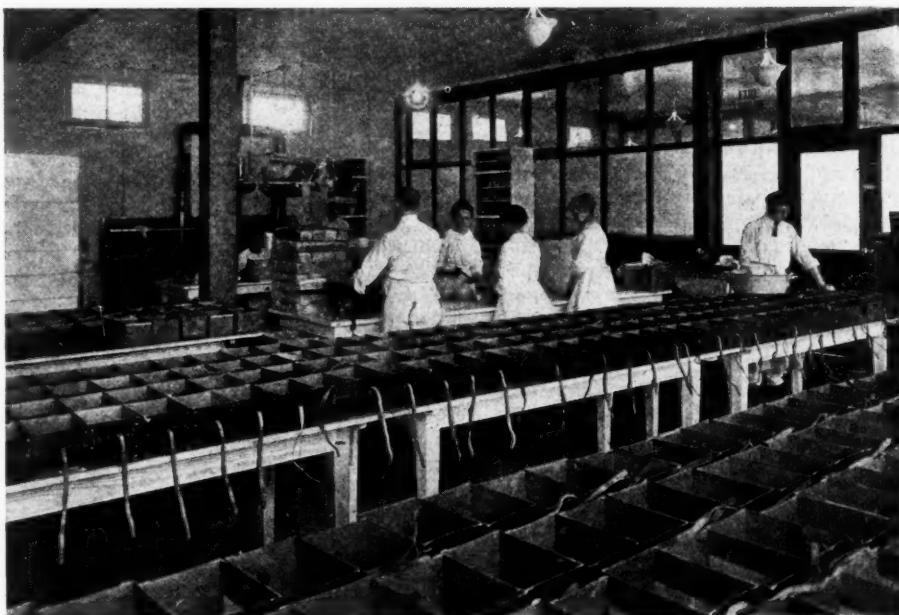
Physical Capacity

The physical capacity of women differs from that of men. Liability of women to injury through lifting weights or by long standing is emphasized by the medical profession. In England considerable evidence has been gathered which shows that the handling of shells and heavier labor work operation tend to produce physical injury to the majority of women engaged in such work. In the great majority of cases where women will be employed within the next few years they will enter upon employment in factories entirely unaccustomed to the conditions. They will come from domestic and clerical and school life, and their muscular strength and physical constitutions and regular inactive habits will be forced to endure changes that will undoubtedly affect their output.

Chief among the slight ailments from which women suffer, and which it will pay employers to regard, are: disturbances of digestion due to unsuitable food, irregular and hurried meals or fatigue, anemia, headache, nervous exhaustion, muscular pain and weakness, and derangement of special physiological functions. English manufacturers have found it profitable to employ medical women to examine applicants for work and determine which are less likely to suffer these slight illnesses.

In addition, they attempt to avoid work which involves lifting and carrying of heavy weights and sudden, violent or physical unsuitable movements in the operations of machines. They have found prolonged standing the cause of permanent and serious injury to women, and where standing is unavoidable they make the hours and spells of employment short and provide seats for frequent intervals of rest.

(To be continued)



The Dayton Engineering Laboratories prepares a box lunch for its female workers in its own commissary department, where the food is selected and prepared. The lunches are sold at cost.

Severe Tractor Test at Toronto

Demonstrations Under the Auspices of the Provincial Government Largely Attended—Government Furnishes Tractors to Farmers at a Fixed Charge Per Acre Plowed

By P. M. Heldt

UNDER the auspices of the Department of Agriculture of the Province of Ontario a three-day motor plowing demonstration and exhibition of modern farming machinery and implements was successfully concluded at Toronto on Sept. 21. It was the third annual event of the kind and was managed for the National Tractor Association by P. G. Van Vleet of Toronto. The demonstrations took place on the Toronto Industrial Farm, located at Richmond Hill, 12 miles north of Toronto. This farm comprises about 400 acres of practically level land and is said to be one of the best managed farms in the province. All of this land, with the exception of a small part planted to beets, was available for plowing. Some of it was in stubble while other sections had been in sod which had been turned some months ago.

This is the only power plowing demonstration besides that at Fremont, Neb., which is approved by the National Association of Tractor Manufacturers, and is intended to popularize the tractor among the farmers not only of the Province of Ontario, but of the whole eastern part of the North American continent. The large numbers of U. S. flags worn at the demonstration indicated that there was a very considerable representation of visitors from below the border line.

Comparing the demonstration with that at Fremont, it was held under the same conditions and therefore is subject to some of the same criticism that was passed on the latter event. Absolutely no attempt was made to check the amount of work done by the different tractors, the time it was done in and the amount and value of the fuel consumed. Everybody had to judge the performance of the different machines for himself. There was, however, this difference between the two demonstrations, that whereas Fremont has a soft, loamy soil which turns quite easily, the soil of the Industrial Farm at Toronto is naturally quite heavy and in addition a protracted dry spell had preceded the demonstration, so that the soil was exceedingly hard and difficult to plow. Even in the case of the deepest plowing there was absolutely no trace of moisture. It is said that tractor manufacturers favor Fremont, Neb., for demonstrations because on account of its light soil they can make a very impressive showing. Richmond Hill, Ont., on the other hand does not give much opportunity for performances that look impressive in print, but it permits of rather severe tests of the tractors. As a result some of the lighter machines did not show up very well. All sorts of plows were, of course, also demonstrated, and in some cases where the plowing was unsatisfactory it was difficult to say whether the fault was chiefly with the plow or the tractor. Also, some of the plowmen seemed to take their task more seriously than others, some plowing continuously for hours entirely unmindful of the crowds watching their work while others fussed around a good deal and spent much time explaining their machines or discussing the subject of power farming in general.

Ontario Farmers Interested in Power Farming

Just at the present time there is a great deal of interest in power farming among the farmers of the Province of Ontario, owing to the scarcity of labor and the high prices paid for farm products. In order to encourage the introduction of motor tractors, a number of patriotic citizens of the Province organized the War Production Club. The latter bought five Bull tractors, which it was intended to let to farmers at fixed

rates. One of these tractors was later given to the Ontario Government and four of them were let to farmers under contract at \$2 per acre, everything included, the section operated being that close to Toronto. The chief idea behind the activities of the War Production Club was to stir up the Government to do something along this line, and since the club succeeded in this plan it has suspended its own activities.

The Government of the Province of Ontario now has 128 tractors of a great variety of makes. In the purchase of these tractors quick delivery was an important consideration and twenty-two different makes are represented in the lot. These tractors are handled by district representatives, of which there is one in every county in the Province. In case there is a call for a Government tractor in any section and the district representative can see sufficient acreage in the neighborhood the Government will purchase a tractor and the district representative will look after it. The farmer pays 45 cents per hour for the operator's time and also buys all fuel used in plowing, while the Government pays all cost while the machine is laid up for any reason and also the cost of labor and fuel while the tractor is being taken from one place to another. The man chiefly responsible for this scheme is C. F. Bailey, Deputy Minister of Agriculture of Ontario. It is said to have been a great help to the farmers of Ontario, for the reason that the season was so backward, and many thousands of acres were plowed which otherwise would have remained uncultivated.

A plan is also on foot for the establishment of a tractor school at the Ontario Agricultural College located at Guelph, which is claimed to be one of the best agricultural colleges in North America. At this school it is intended to educate or train men to operate the tractors purchased by the Government and also to give farmers an opportunity to familiarize themselves with the operation of tractors.

Weather Ideal

Weather conditions at the demonstration were almost ideal, the only untoward incident being a slight shower on the second day, which was the main day of the event. The attendance was very satisfactory, many farmers coming to the demonstrations in their automobiles from far away points. On the first day there were about 300 automobiles parked on the demonstration grounds, on the second day about 400 and on the last day slightly more than 200. A charge of 25 cents was made for parking cars.

In addition to tractors, plows and other farm implements were exhibited. These exhibits were housed in tents. In the main tent, where the headquarters of the management were located, there were also a number of exhibits of automotive accessories and engines. This was surrounded by smaller tents, the whole being arranged in a square. The land in this part of Canada is slightly rolling and the tent colony was located on an elevation so that it could be seen from far off. With men from the Camp Borden aviation training grounds, near by, flying overhead, hundreds of automobiles parked on the grounds and scores of motor tractors busily engaged in turning the soil, the scene was one that will not soon be forgotten by those whose interests are associated with the automotive industries.

Owing to the transportation difficulties some of the firms which had entered tractors were prevented from taking part in the demonstrations. Thus the Gray Tractor Co.'s machine

got side tracked in Chicago and the Parrett Tractor Co. of Chicago and the Hart-Parr Co. of Charles City, Iowa, who figured in the list of exhibitors, were not represented.

Canada is evidently developing a tractor industry of her own, about half a dozen tractors of Canadian manufacture taking part in the demonstrations, though the engines and some other components in most cases were of U. S. manufacture. The smallest tractor built in Canada that was exhibited was the Essex 6-12. This has a four-cylinder Continental $3\frac{3}{4}$ by 5 in. engine with magneto ignition and a governor. A cooling tank is used instead of a radiator, the advantage claimed being greater reliability. Of course, from the standpoint of cost the tank also has the advantage. The Essex is a four-wheel tractor with the engine over the rear axle, the cooling tank over the front axle and the transmission gear in between. The drive to the 40 in. driving wheels is by chain. Two speeds forward are provided by the gear, as well as a reverse. The transmission gear is of the type in which all gears remain constantly in mesh. The Essex has a 60 in. wheel base and can turn in an 8 ft. circle. A 15 in. belt pulley of 6 in. face is mounted on a crossshaft about midway between the front and rear wheels and is controlled by the engine clutch, which is of the conical type. The weight of the tractor with all tanks filled is 2800 lb.

Regarding the cooling system it may be said that the cooling tank gave off a great deal of steam after the tractor had hauled a plow for some time. This is apt to be interpreted as showing that the engine is overheated, which is usually the case when a radiator steams in a similar manner. However, the tank cooler has little chance of disposing of heat except by evaporation, but as long as there is enough water in the tank the engine will not overheat. The Essex people sold their demonstrating tractor at the exhibition, to a farmer residing not far from Toronto, and delivered it to him at once.

Three Makes of Creeper Tractors

Three different makes of creeper type tractors were represented, viz., the Cleveland, the Neverslip made at Watertown, Wis., and the Decker a Canadian-made machine. The Never-slip track laying mechanism is quite similar to that of the Cleveland. This machine has a frame on which are journaled two axles carrying sprocket wheels to which the track laying chain is fitted. There are two pairs of carrying wheels journaled on the same frame, which run on the chain track. All of the weight of the tractor is available for traction purposes and as it is distributed over a large surface on the ground the soil is not packed so tight. This tractor is made in several different sizes. The largest sizes, rated at 50-80 hp. are of different construction from the smaller ones, in having a pair of front steering wheels in addition to the creeper mechanism.

The Decker tractor, made by the McDonald Thresher Co., Ltd., of Stratford, Ont., has separate front steering wheels and a rear creeper construction. A four-cylinder engine is fitted and friction disk and wheel transmission is employed. The differential gears are inclosed and run in oil. Concerning the unit pressure on the ground the manufacturers give the following figures: The chain or creeper track is 36 in. long between centers and 8 in. wide, which gives an area of 288 sq. in. With a total weight of about 2900 lb. on the two creepers this figures out to about 5 lb. per sq. in.

Another Canadian tractor taking part in the demonstrations was the Sawyer-Massey, made by Sawyer-Massey, Ltd., Hamilton, Ont. This is made in two sizes rated at 12-22 and 27-50 hp. respectively. These tractors both have the four-cylinder engine over the rear axle, the radiator in front and the transmission gearing, fuel tanks and other parts in between. With this arrangement of the component parts the drive of the fan is somewhat awkward. The cylinder dimensions of the small engine are 4 by 6 in. and the engine operates at 700-1000 r.p.m. This tractor has 54 by 14 in. rear wheels and 28 by 5 in. front wheels. A 21 by 8 in. belt pulley is provided and turns at one half crankshaft speed. This tractor weighs 5200 lb. and has a capacity of three to four plows. Its two forward speeds are $2\frac{1}{4}$ and $3\frac{1}{2}$ m.p.h.

Considerable interest was aroused at the exhibition by a demonstration of the Buckeye traction ditcher made by the Buckeye Traction Ditcher Co., Findlay, Ohio. This machine,

operated by an internal combustion engine, makes trenches for laying drain tiles. It is made in eleven different sizes to suit the dimension of the ditch required. The ditcher consists essentially of a creeper type tractor to the rear end of which is attached a digging wheel which can be raised and lowered and to which power is transmitted by a chain and pin wheel mechanism. The dirt picked up by the shovels as they pass through the ground is dropped onto a conveyor belt as the shovels reach their highest point, and the conveyor drops it to the ground at a sufficient distance from the ditch so none will run in to the latter again. A demonstration of the ditcher was made on the last day of the exhibition. Although the soil was absolutely dry to the full depth of $1\frac{1}{2}$ ft. to which the ditch was sunk, the ditcher worked well. Much trouble was encountered, however, as a result of numerous rocks in the ground.

Very creditable work was done by a pair of Moline Universal two-wheeled tractors and a Universal Harvester Co. tractor operating at that part of the farm most remote from the exhibit. Something of a curiosity was the Rein Drive tractor, a Canadian product. This tractor is operated from a seat on the plow by means of a pair of reins. No very definite information could be obtained regarding the control and other features but it seemed the rein control affected only the starting and stopping of the tractor. Having only two reins to handle instead of perhaps a half a dozen or more levers may appeal to the farmer, but it is doubtful whether effective control under all conditions of field work and traveling on roads can be combined in a pair of reins.

LIST OF EXHIBITORS

- Aldorfer Bros., Peoria, Ill.
- Aspinwall Canadian Co.
- *Avery Co., Peoria, Ill.
- Canadian Allis Chalmers Co., Toronto, Ont.
- T. E. Bissell & Co., Elora, Ont.
- Beeman Garden Cultivator Co., Minneapolis, Minn.
- Buckeye Traction Ditcher Co., Findlay, Ohio.
- W. H. Benfield & Sons, Toronto, Ont.
- Bateman-Williamson Co., Toronto, Ont.
- J. I. Case T. M. Co., Racine, Wis.
- Cockshutt Plow Co., Brantford, Ont.
- Challenge Tractor Co.
- Cleveland Tractor Co., Cleveland, Ohio.
- Chapman Engine Mfg. Co., Dundas, Ont.
- Canadian Rein-Drive Tractors, Ltd., Toronto.
- Canadian Fairbanks-Morse Co., Toronto, Ont.
- Dauch Mfg. Co., Sandusky, Ohio.
- John Deere Plow Co., Welland, Ont.
- Donning Motor Tractor Co., Cedar Rapids, Ia.
- H. C. Doman Co., Oshkosh, Wis.
- Electric Wheel Co., Quincy, Ill.
- Elgin Tractor Corp., Elgin, Ill.
- Eureka Mower Co., Utica, N. Y.
- Essex Tractor Co., Essex, Ont.
- Erd Motor Co., Saginaw, Mich.
- Fawick Tractor Co., Chicago, Ill.
- Farm Tractor Co., Fond du Lac, Wis.
- Four Drive Tractor Co., Big Rapids, Mich.
- John Goodwin Threshing Co., Sarnia, Ont.
- Grand Detour Plow Co., Dixon, Ill.
- Gray Motor Co., Detroit, Mich.
- Gurney Ball Bearing Co., Jamestown, N. Y.
- Gray Tractor Co., Minneapolis, Minn.
- Goold Shapley & Muir Co., Brantford, Ont.
- Hart-Parr Co., Charles City, Iowa.
- Huron Tractor Co., Port Huron, Mich.
- Hyatt Roller Bearing Co., Detroit, Mich.
- Imperial Oil Co., Toronto, Ont.
- Interstate Tractor & Engine Co., Waterloo, Iowa.
- International Harvester Co., Hamilton, Ont.
- Kokomo Electric Co., Kokomo, Ind.
- R. A. Lister & Co., Toronto, Ont.
- John Lauson Mfg. Co., New Holstein, Wis.
- Lacrosse Tractor Co., Lacrosse, Wis.
- Link Belt Co., Chicago, Ill.
- Lacrosse Plow Co., Lacrosse, Wis.
- McDonald Thresher Co., Stratfield, Ont.
- Monarch Tractor Co., Chicago, Ill.
- Malby Auto Specialty Co., Detroit.
- Moline Plow Co., Moline, Ill.
- Massey-Harris Co., Toronto, Ont.
- Duane H. Nash, Inc., Wellington, N. S.
- Norma Co. of America, New York.
- Oliver Chilled Plow Works, South Bend, Ind.
- Parrett Tractor Co., Chicago, Ill.
- Russell Wind Stacker Co., Indianapolis, Ind.
- Redden Truck Co., Chicago, Ill.
- Rock Island Plow Co., Rock Island, Ill.
- C. H. Rooke Co., Ltd., Toronto, Ont.
- Reed Fdry. & Mch. Co., Kalamazoo, Mich.
- Sawyer & Massey Co., Hamilton, Ont.
- Sumpter Electrical Co., Chicago, Ill.
- Smith Motor Truck Corp., Toronto, Ont.
- Reliance Iron Works, Toronto, Ont.
- Universal Lug Co., Chicago, Ill.
- Waukesha Motor Co., Waukesha, Wis.
- Wolverine Tractor Co., Detroit, Mich.
- Waterloo Mfg. Co., Waterloo, Ont.
- Geo. White & Sons Co., London, Ont.
- Waterloo Gasoline Engine Co., Waterloo, Iowa.
- Wilcox Bennett Carburetor Co., Minneapolis, Minn.
- Westinghouse Electric & Mfg. Co., Pittsburgh, Pa.

Specifications of 1½-Ton Aviation Truck

Signal Corps Designs Special Truck on Pneumatic Tires for Speedy Airplane Service

By A. L. Clayden

WASHINGTON, D. C., Sept. 26.—Owing to the different nature of the work, the trucks used by the Signal Corps for aviation use will not be the standard war trucks now being made for general army transport. The Signal Corps will have two sizes of truck, one light and the other a more normal 3-ton job. There will be approximately two of the light type to each one of the heavy. Both trucks will be special assembled propositions, made from standard parts, and the first orders have been given to General Motors for the light type and Kelly Springfield for the heavy.

Specifications for the heavy truck are now being drafted in final detail, and will be issued shortly.

GENERAL PROVISIONS—The load capacity on pneumatic tires shall be 2000 to 3000 lb.

For chassis outline, see drawing General Motors Truck Co.'s No. C-7202.

WHEEL BASE—149 in.

FRAME LENGTH—Behind driver's seat, 121½ in., approximate.

TREAD—Front wheels, 58¼ in. Rear wheels, 58¾ in.

MOTOR—Continental C2 built especially for truck service. 35 actual horsepower. Vertical four-cylinder, four-cycle, water-cooled, located under hood in front of dash and carried on three point suspension in a unit with clutch and transmission. Cylinders L type, cast in block, 4½ in. bore, 5½ in. stroke. Crankshaft drop forged, heat treated steel on three extra large bearings. Cams forged integrally with camshaft, hardened and ground. Camshaft carried on three extra large bearings. Connecting rods drop-forged and heat treated. All bearings die cast babbitt in bronze shell. Wrist pins hardened and ground, working in bronze connecting rod bushings. Valves 2 in. diameter, fully inclosed by removable cover plate. Helical timing gears. Aluminum crankcase.

OILING SYSTEM—Combination force feed and constant-level splash system. Plunger pump driven by eccentric on cam-shaft, supplies oil to timing gears and to each main bearing. Oil drains back into oil pan which forms lower half of crankcase, keeping constant level for splash lubrication of pistons, connecting rod and camshaft bearings. Oil gage on dash. Indicator on crankcase shows depth of oil. Strainer in oil pan keeps oil in crankcase free from dirt, sediment, etc.

CARBURETER—Marvel 1 in. automatic float-feed type, with throttle operated either by hand lever or foot accelerator.

IGNITION—Jump spark, single system. Eisemann high-tension, water-proof magneto. Spark control lever above steering wheel. Switch on dash.

COOLING SYSTEM—Shaft-driven centrifugal water circulating pump, 18 in. fan on ball-bearing driven by V-shaped leather belt. Special truck design tubular radiator of extra large water capacity, with cast iron top and bottom tanks and side frames, rigidly bolted to chassis frame. Entire radiator can be easily taken apart for thorough cleaning, and any individual part can be replaced without purchasing an entire new radiator.

GOVERNOR—Monarch automatic governor, fully inclosed and Yale locked, operates special valve above carburetor independent of hand and foot throttle.

CONTROL—Left-hand drive, center control, spark and throttle levers above steering wheel; also a foot accelerator. Levers move forward to advance spark and open throttle. Clutch and service brakes operated by pedals. Gear changing and emergency brakes operated by hand levers.

CLUTCH—Multiple-disk dry-plate clutch, in unit with motor and transmission. Clutch shaft mounted on ball bearings, with

ball thrust bearing on clutch throw-out collar.

The light-truck specifications are complete, and follow below. It is intended to run the light trucks at high speed, neglecting the governor for the bulk of the work, which will consist largely of transporting airplanes and their parts. The Signal Corps has been advised that practically every one of the light trucks should have a two-wheel trailer with a body of light construction 20 ft. long, this being large enough to contain the best part of a whole airplane of usual size. These trailers are now being designed.

In a squadron there will be about twenty-seven trucks, two-thirds at least being the light model. One of the large trucks will be a traveling repair shop.

(See General Motors Truck Company's Drawing C-6476 for front wheels.)

TIRES—Goodyear straight-side, cord-constructed shoes with all weather treads on both front and rear wheels. Fronts, 35 by 5, pneumatic. Rear, 38 by 7, pneumatic.

RIMS—Front tires on Kelsey demountable rims as shown by General Motors Truck Company's Drawing No. C.

Rear tires as shown by General Motors Truck Company's Drawing No. C.

FRAME—Open hearth, pressed steel, heat treated. Material is specified within close limits and carefully checked by chemical analysis and physical tests. Side members are 5 in. deep by 3 in. wide, just back of the driver's seat, at point where greatest stress occurs.

STEERING GEAR—Screw-and-nut type, fully inclosed and lubricated. Fore-and-aft steer. Left-hand drive. Inclined column. Large leverage with 18 in. hand wheel. Spark and throttle levers above steering wheel. Spring connections in steering rod.

GASOLINE TANK—A seamless cylinder of pressed steel, positively non-leakable. Located under driver's seat, suspended in a seat riser. Capacity 23 gal. (Shown by General Motors Truck Co. Drawing No. B-4640.) The General Motors Truck Co. is permitted to furnish at its option tank as specified above or an interchangeable tank of practically same dimensions as shown by its drawing C-7174.

FENDERS—One-piece heavy pressed steel, rigidly braced at two points, over front wheels. No rear fenders.

DRIVER'S SEAT—Wide enough to accommodate four persons. (Shown by General Motors Truck Co. Drawing D-7168.)

TOP OVER SEAT—Similar to quarter-master's design. (Shown by General Motors Truck Co. Drawing D-7167.)

EXTENSION FOOT REST—(As per General Motors Truck Co. Drawing C-7173.)

EQUIPMENT—Two oil side lamps, one oil tail lamp, mechanical horn, jack, complete set of tools as per General Motors Truck Co. Drawing A-7208.

Hub Odometer—Dreadnaught type.

Front bumper—Spring type, as per G. M. T. C. Drawing D-6958.

Rear bumper—As per G. M. T. Co. Drawing.

Front tow hook—As per G. M. T. Co. Drawing No. C-7146.

Rear tow hook—As per G. M. T. Co. Drawing.

Radiator Guard—As per G. M. T. Co. Drawing No. X-7171.

Two sills to be attached to chassis frame, from back of driver's seat to rear of frame and two sill angles with six bolts, all as per General Motor Truck Co. Drawing D-7178. Twenty bolts and twenty bolt plates for attaching body as per General Motors Truck Co. Drawing D-7178.

Price of foregoing chassis, with equipment as shown, chassis painted in prime coat. Two thousand, forty dollars and seventy-two cents (\$2,040.72). F.o.b. Pontiac, Mich.

GEORGE O. SQUIER,

Brigadier General, C. S. O.

ball thrust bearing on clutch throw-out collar.

TRANSMISSION—Brown-Lipe and G. M. C. Sliding gear, selective type. Four speeds forward and one reverse with direct drive on fourth speed. Ball bearings throughout. Carried in unit with clutch and motor on three-point suspension, permitting direct connected gear shift lever. Low gear reductions give unusual pulling power when needed.

DRIVE—A solid steel shaft of large diameter from transmission to rear axle. This shaft is in two sections with three universal joints and is supported in center on a self-aligning ball bearing. This construction prevents vibration, whipping and springing out of shape, to which a long unsupported shaft is liable, with resultant wear and strain on the universal joints and bearings at each end. The three universal joints are simple and rugged, require no adjustments, and are contained in dust-proof, waterproof and grease tight housing.

FRONT AXLE—Drop forged 1 section, 2¾ in. high by 2 in. wide. Steering knuckles drop forged and heat treated, with hardened and ground steel bushings in wearing parts provided with grease cups. Knuckle tie rod is back of axle, where it is safe from accidental bending.

REAR AXLE—Timken-David Brown worm of special alloy steel, and worm gear of special bronze. Gear reduction 7% to 1. Semi-floating driving shafts of chrome nickel steel, heat treated, of large diameter, with splined inner ends and outer ends tapered and keyed to rear wheels. Shafts can be easily removed. Differential-bevel pinion differential with four pinions. All gears drop forged, hardened and heat treated.

RADIUS RODS—One section adjustable, with swivel front end connection. All wearing parts bushed with provision for lubrication. A direct positive connection between the driving axle and the chassis frame relieving the rear spring of all driving strains and thus adding materially to the life and efficiency of the spring.

SPRINGS—Semi-elliptic, high carbon, oil tempered steel, with bronze bushed eyes. Spring bolts hardened and ground, and fitted with grease cups. No center bolts. Extra heavy spring blocks, top and bottom, with extra heavy nickel steel spring clamps. Front springs, 2½ in. wide by 36 in. long. Rear springs 3 in. wide by 54 in. long.

BRAKES—Duplex system, consisting of four Raybestos lined brake shoes expanding in a pressed steel drum on each rear wheel. The two opposite shoes in each drum are service brakes, operated by pedal, and the other two opposite shoes are emergency brakes, operated by hand lever. Brake rods so arranged that when service brake shoes become worn the emergency brake shoes can be used for service brakes by simply crossing the brake rods.

WHEELS—Artillery type, wood, Timken roller bearings. (See General Motors Truck Company's Drawing C for rear wheels.)

Specialization in Aircraft Production

Work of Building the Air Fleet Will Be Divided Among Numerous Industries—Those Who Will Share in the Work

By P. M. Heldt

IN the big aircraft-production plans now being evolved by the Aircraft Production Board at Washington a great many different industries are directly interested. Undoubtedly the existing aircraft factories, some of which build their own engines and manufacture most of the other parts from the raw materials, will be enormously expanded, yet the program is so large that they alone cannot possibly fill it. There already are a number of firms which have been building aircraft partly on the assembling plan by purchasing the power plant and building it into aircraft of their own construction. This practice will be greatly extended, and specialization will become the watchword in the building of the air fleet. This tendency will be greatly helped along by the decision of the Aircraft Production Board to standardize not only aircraft engines but airplanes of different types as well, as indicated by the issuance of specifications for primary training machines.

Plane and Power Plant

Aircraft production naturally divides into two parts, viz.: the manufacture of the plane and the manufacture of the power plant. Even where the same company manufactures both parts, the manufacturing operations are generally conducted in separate buildings. Entirely different equipment and entirely different classes of skilled labor are required for the two classes of work. We may therefore take it for granted that practically all of the engines needed for the aerial fleet will be built in separate establishments, even though some of these may belong to companies also building planes.

All of the engine accessories will, of course, be built by the manufacturers of similar accessories for automobiles. This applies to the carburetors, magnetos, spark plugs and radiators. In each case special designs, aimed chiefly at lightness, have been or will have to be developed. The chief operating requirements are very much the same as in automobile work, only for certain performances the apparatus must be lighter. In the case of spark plugs, of course, lightness is not so important, but rather freedom from overheating under the high compression and substantially full-load operating conditions obtaining in aircraft engines. The accumulated experience of the manufacturers in each of these lines will fit them better to solve the new problems arising in connection with the particular accessory in airplane work than concerns not possessing this experience.

In the manufacture of the engines proper use will be made of large quantities of materials in a state of partial manufacture. Thus some of the engines for primary training machines have cylinders of cast iron or semi steel, which are generally obtained from foundries specializing in this line. The more powerful engines for actual war work will probably have steel cylinders, which are turned from hollow hydraulic forgings produced by another branch of industry. There will naturally be many drop forgings in these engines, the most important being the crankshaft and connecting rods. As both of the engineers supervising the design of

the U. S. A. engine have been using aluminum pistons in their previous work, and as high piston speeds are really essential, it is a pretty safe guess that this engine will have aluminum pistons, which will provide work for another line of industry. Crank cases, of course, are also made of aluminum, as are a considerable number of small parts on the average airplane engine, including the pump housings and inlet manifold.

Each engine has a large number of bearings, including crankshaft main bearings, connecting-rod bearings, camshaft bearings, etc. Leaving out of consideration for the moment the rotary type of engine, most of these bearings will undoubtedly be of the plain bronze bushing and of the bronze shell babbitt-lined type. Bearing bronze ingots, as well as complete bushings, are furnished by several concerns making a specialty of such products. But while the crankshafts are, for the most part, mounted in plain bearings, ball bearings are used on some of the auxiliary shafts, and the ball-bearing industry also has an interest in the airplane. The end thrust of the propeller, which is very great, is always taken up on ball thrust bearings.

There is now nearly always a gear reduction between the engine shafts and the propeller, and gear-cutting concerns therefore have a chance of securing a share of the work of building airplanes. The propeller is the basis of a separate industry.

Taking up next the structural part of the plane, vast quantities of materials are required, such as spruce for the spars and struts, linen, wire and rope. In the building up of the fuselage and the wing structure, use is made of a large number of metal fittings. A beginning has been made in standardizing these fittings, and all those that are standardized will certainly be turned out by efficient manufacturing methods.

Fuselage and Wings

Enormous facilities will have to be provided for building fuselages and wings. Probably new plants will be erected in most instances, though it is not impossible that some roomy, well-lighted existing structures will be found suitable for the purpose. Probably no other industry is so well qualified to take up this work as is the automobile body industry, which also works with hardwood, sheet metal, and canvas. It is quite possible that the construction of the wings and fuselage will be considerably subdivided. Thus all wood frame members might be manufactured in one plant, metal frame members in another, the frame assembled in a third, and the fabric applied in a fourth.

Numerous accessories and instruments are required for military airplanes. Each machine is equipped with a clock, a barometer, a revolution counter, a gasoline gage, an oil gage, a radiator thermometer, a pressure indicator for the fuel system, and a fire extinguisher. Other articles of equipment that are likely to be carried on some of the machines are a compass, a drift gage and a wind gage. A complete set of specially made tools also goes with each plane.

Ignition and Lighting on War Trucks

All Ignition Details Are Special Excepting Battery and Magneto
—New Designs of Lamps Developed—Equipment Details Settled

By A. L. Clayden

WASHINGTON, D. C., Sept. 25.—There is little to record in connection with the standard military truck this week, except that the detail matters remaining to be cleared up a week ago are now much reduced in number. One of the most important jobs undertaken last week has been the design of special lamps which have been found to be necessary.

The electrical equipment has been outlined previously as consisting of complete double ignition, generator, battery and lamps. Every part of this is special except the battery and the magneto. For the former, any good standard make will be acceptable. For the latter, two or three makes will probably be used. The generator is a round-frame type, held against the back of the front-end casing by a flange, where it is easy to detach and replace. It is a 7-volt machine, and is large enough to take care of the full lamp and ignition load. Being located on the right side of the crankcase, it is well below the tappet level, and the only other part in its immediate vicinity is the carburetor, although the two do not interfere with each other.

The magneto, on the left side, is driven by a coupling from the tail end of the pump shaft, and the timer is at the extreme front end of the left side, adjacent to the pump-drive gear.

The lamps have been a source of much discussion. It was formerly intended to use two combination oil and electric side lamps and a single big searchlight. Then it was found that the ordinary searchlight was so heavy when strong enough that it would be difficult to mount rigidly upon the high sheet-steel dashboard. Next it was found that extremely small lights would be needed for driving in the danger zone, unlike anything obtainable on the market.

Another point which arose was that with a dashboard gasoline tank the presence of oil lamps on the front of the dash was undesirable, so this disposed of the combination lamp.

Thus the ultimate equipment was arrived at, this consisting of a pair of 6-in. headlamps mounted on brackets high up on each side of the dash; a pair of danger-zone lamps, and a tail lamp. The latter was wanted without any white light, as there is no license tag to illuminate, and there is no object in having more light at the rear than will just suffice.

The special little lamps for use close to enemy lines have been made up from W. F. Bradley's account in THE AUTOMOBILE AND AUTOMOTIVE INDUSTRIES of how Italian drivers took old shaving-soap boxes and put a lamp at the extreme end, then strapping the box on some spot where it would throw light on the front wheel. Experiment showed that the best light was obtained by using a tube of just about soap-box size, but dead black internally, and tilting this down at an angle of 30 deg. to the horizontal. With a bright interior, even this rig could be seen a long way ahead, but the interior blacking reduced its visibility immensely while seeming not to affect the driving light perceptibly. For these lamps there will be two sockets, one on each side of the dash, at a

height to be determined by experiment. The outer tube of each is practically a part of the dash, although detachable, and the inner portions, including the bulb, can be withdrawn in a moment.

The headlamps are stronger than normal, and have a new sort of parabolic reflector made from glass instead of sheet metal. The purpose of this is to retain the brilliancy, since the glass is silvered on the back and is quite unaffected by atmospheric conditions. Strength is given the glass in a most ingenious way. First, the glass is molded and polished on both sides and then it is silvered on the back. In this condition it is thick enough to be fairly strong. It is then heavily copper plated on top of the silver, so heavily that considerable rough handling cannot affect the glass. The finished reflector is mounted in a similar manner to a metallic one, except that it sits on a gasket of soft material, and closing the front door grips it with another gasket. The focus is obtained by turning a knurled screw on the outside of the lamp case, which traverses the bulb without rotating it. The door is hinged at the top, and held at the bottom by a screw clip, and the glass will be the variety in which wire mesh is embedded.

A single switch has been worked out to care for all the circuits, both ignition and lighting, and this will be set in the instrument panel on the cowl. There are no fuses, merely an automatic circuit breaker contained in the switch box, which can take care of a short in any circuit. All the way through, the electrical units are uncommonly robust.

A different sort of detail of the truck which is quite important is the scarcity of oil or grease cups. Owing to the spring shackles being provided for on a well-and-wick system incorporated in the spring brackets, all lubricators on spring bolts are eliminated. There are a few on the front axle, on the brake mechanism and control, and one on the clutch for feeding the throwout bearing, all readily accessible.

An equipment detail settled finally is the disposition of chassis supplies. Under the seat, besides the battery at the right end, there is a 16-gal. gasoline tank at the opposite end. This leaves a central space which will contain four special cans, three filled with oil and one with grease. These are an easy fit in the compartment, allowing the necessary space for cloths or waste. The seat overhangs the frame a great deal on either side, being four men wide, so there is room for a large box each side, outside the frame and beneath the spare gas tank and the battery respectively.

On the right this box will contain the tools, of which a rather better kit is to be provided than goes with most commercial trucks. On the left two pails will be carried with watertight covers, these being for water that can be used either for the engine or for drinking purposes. The original scheme was to have a tank here for water, but this would require the use of a pail or hose for filling, and also it could not be scoured and kept fit for drinking water. The pail scheme may not work out satisfactorily, but indications are encouraging.

Airplane Engine Production Methods*

Machine Shop and Metallurgical Operations in the Manufacture of an Airplane Four-Cylinder Engine with Individual Cast-Iron Cylinders—Routine of Tests

By P. M. Heldt

OWING to the fact that airplane engines will soon have to be built in many plants that have had no direct experience in this line, the following account of the production methods used in turning out an airplane engine should be of timely interest. The methods have been laid down for production on a scale unprecedented in the history of airplane-engine construction in this country.

Upon receiving the cylinders from the foundry they are annealed by heating them in a furnace to 1400-1440 deg. F., according to their hardness. When the cylinders arrive, their scleroscope hardness is about 30. They are raised to a temperature of 1440 deg. in 5 hr. and are left at that temperature for about 2 hr., after which they are allowed to cool all night. After annealing they are sandblasted to remove all scale before they go to the machine shop. The finished cylinders must have a scleroscope hardness of not less than 26. After being machined, the cylinders are tested under water pressure for leaks.

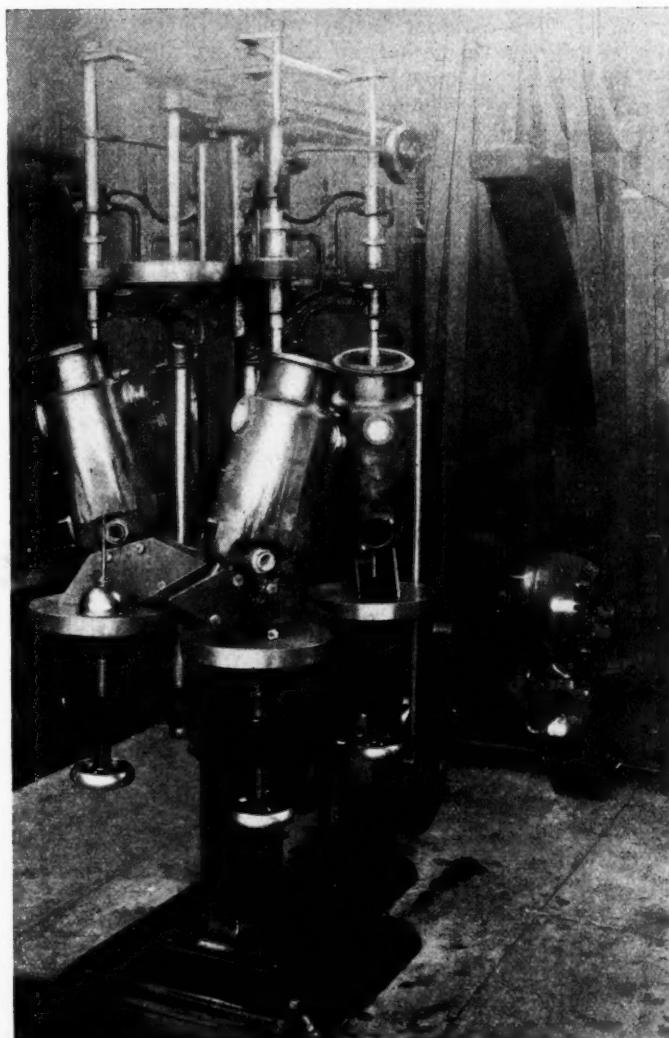
All leaky cylinders are oil-treated with red lead and linseed oil, mixed to such a consistency that it will run freely. This mixture is made up of 2/3 gal. of oil and two tablespoonfuls of red lead; it is placed in the cylinder and subjected to an air pressure of 90 lb. per square inch, which presses the oil and lead into all small crevices and leaky spots. The cylinders are then placed in a furnace, which was previously brought to a temperature of 500 deg., after which the fire was turned off and the furnace allowed to cool to 360 deg. before the cylinders were put in. The furnace is then closed and the cylinders are allowed to bake all night without further heat.

First Machining Operation

After the cylinder castings have been annealed they have the wires and core sand cleaned out and are inspected for defects. The first machining operations on them consist in rough finish boring the cylinder. At the same setting the cylinder is counterbored and has a radius formed, the top end hole is bored, counterbored and spot-faced, and the flange on the lower section of the barrel is turned and faced and the corner is chamfered. Next, the outside of the cylinder barrel is turned down over the lower end and milled at the top end between the valve-stem bosses. Next, the exhaust and intake sides of the cylinder are milled off. The valve-stem bosses are then turned, drilled, spot-faced, countersunk and reamed. The four camshaft housing stud holes and four cylinder hold-down holes are drilled. Next, the flat sides of the cylinder are milled. After an inspection of the cylinder walls for thickness, the valve seats are bored, the spark-plug holes drilled, spot-faced and tapped, the manifold stud holes drilled and

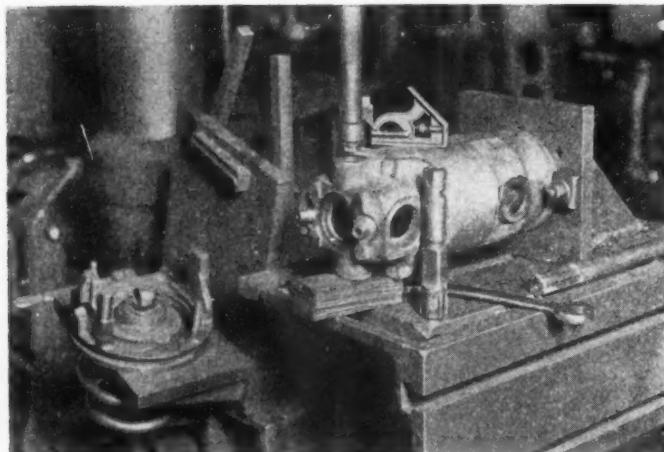
tapped, the pet-cock hole is drilled and tapped, and the hole for the wiring-tube bracket drilled. The whole cylinder casting is then filed and burred where necessary, the 2-in. hole on top is tapped twenty threads to the inch, the water test already referred to is applied, and after the cylinder has dried off the barrel is ground. Re-reaming and grinding of the valve seats completes the machining operations on the cylinder.

Work on the crankcase (upper half) starts with the boiling of same in superheated water to release internal strains. The entire inside surface of the crankcase, with the exception of the bearings, cylinder ports and magneto housing hole, is then scraped and filed. After inspection,



Fixture for boring valve seats which make an angle of 15 deg. with the cylinder axis

*Passed by the Committee on Public Information.



Boring and facing water inlet hole in cylinder casting



Overhauling stands and parts racks in the testing department

machining begins, the first operations consisting in rough milling the top and bottom faces, then finish-milling them and drilling all holes on the oil-base face, except the crankshaft bolt holes and one oil hole in the flange. Next the holes for the cylinder holding down bolts are taken up. These holes (39/64 in.) are drilled halfway through the casting from the bottom face and then, by means of an index jig, from the top side, at the same time drilling all other holes on the top side of the case. The cylinder hold-down bolt holes are now reamed halfway through from the bottom side, then the jig is put on the top of the casting and the holes are reamed from the top with a 5/8-in. reamer.

The lower end of the cylinder barrel, that part below the flange, is guided in a machined hole in the crankcase, and these four holes are next bored and reamed, as is a hole at the forward end into which sets the housing for the magneto and pump drive. All main bearings and both ends of the case are straddle milled. All five crank-shaft bearings are rough and finish-bored, the front end of the front crankshaft bearing is faced and both ends of the case are bored.

Most of the remaining operations on this part are drilling and tapping operations, which need not be enumerated singly. Finally, when all machine work on the case has been completed, it is scraped on the outside, inspected, and—if passed—sent to the stock room.

For a small and simple part the connecting-rod requires a great deal of work to be done upon it. In fact, the operation sheet for this part enumerates no less than forty-six successive operations. The rod is first snagged

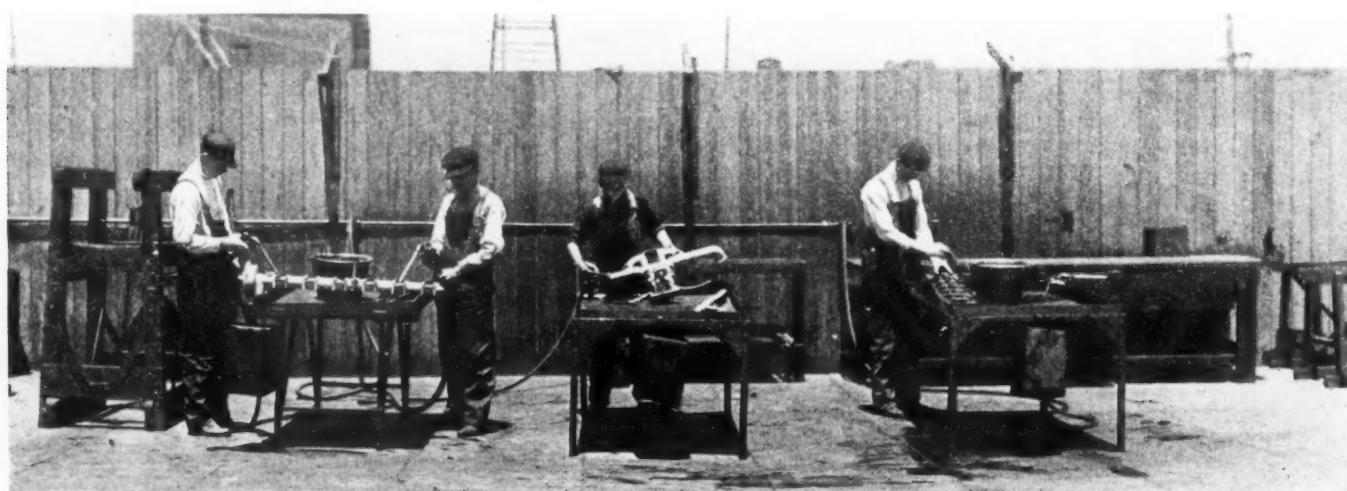
all over and is then inspected for defects. After straightening it, both ends are straddle-milled and the rod is then straightened once more. The caps being forged integral with the rods, the big ends are next machined, being first drilled out to 2 17/64 in., then fly-cut to 2.320 in., and then fly-cut to 2.335 in. The piston pin hole at the other end of the rod has three similar operations performed upon it and is then hand-reamed to size, whereas the big end hole is ground to size.

Both ends of both bosses are next rough-turned, the width of the channel section is rough-milled to 1 1/4 in., and the channel section is roughed out by a profile mill, in which operation 1/32-in. stock is left all around for the finishing cut. The 1-in. width of the section is milled on both sides, the 1/2-in. radii are finish-milled, both bosses are straddle-milled, the bolt bosses form-milled, all sides of the shank are finish-milled, the channel section is finish profile-milled and both ends of the rod have their taper finish-turned.

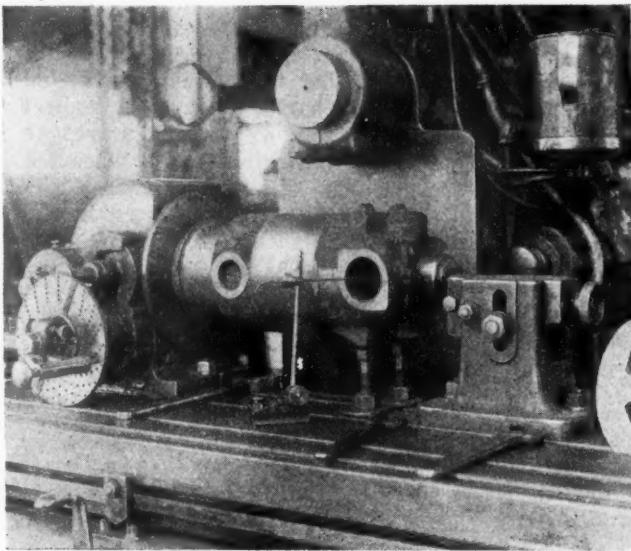
Profile Mill Used for Big End

Not all of the big end can be turned, and the rest must be worked down to the proper size by a profile mill, this being done first on one side and the rod then turned over and the operation repeated on the other side. The small end is treated in the same way.

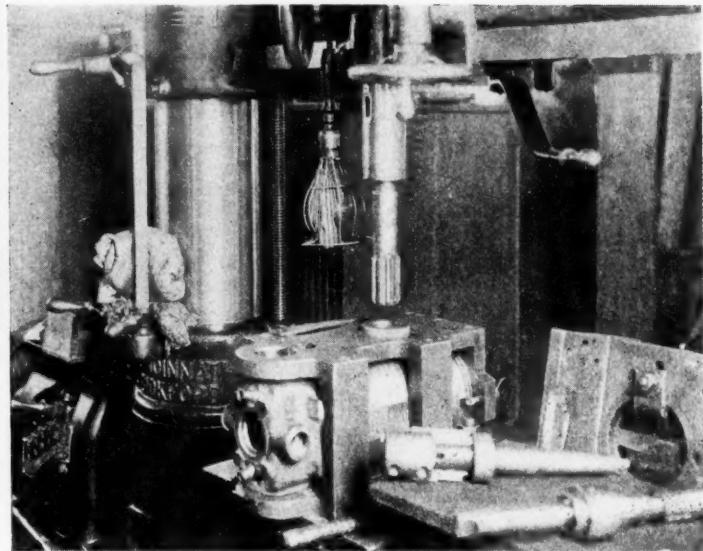
The fillet tangent to the bolt bosses is next profiled, the bolt holes are drilled and reamed, holes for the oil pipe are drilled in each end, four oil pipe clamp holes are drilled, all sharp edges are removed, and the radius is finished up after profiling and weighing.



Cleaning parts with distillate. This work is done in the open air



Cylinder in milling machine for finishing the upper part of the jacket wall



Jig for boring water inlet hole and breaking corners on inlet and exhaust manifold holes in cylinder casting

After the rod is split, *i.e.*, the cap detached, the rod is heat treated and is then straightened. Both holes are then ground to the finished diameter and the rod is balanced. The lower bearing bushing is put in, holes for escutcheon pins are drilled and countersunk and the pins are put into the bearings and rods and riveted over. The babbitt is fitted flush with the rod, the rod and babbitt are surfaced and the caps are put on. Next the piston-pin bushings are pressed in, oil holes are drilled through both ends of the bearing, an oil groove is chipped in and the oil tube is put on the rod.

The wristpin end is next heat treated and is then reamed out to within 0.0005 in., after which it is broached out. Once more attention is turned to the large end, which is fly-cut and has the fillet formed, after which the rod is ready for weighing and inspection. The completed rod looks quite simple and gives little evidence of having so much work done upon it, but it has not an unfinished spot upon its surface, hence it is not only as light as it can be made and all rods weigh the same to within very close limits, but the distribution of weight in the rod is the same in all.

Machining Camshaft Housing

One more example of the machining methods used in the production of this engine may be given. The cam-shaft housing on the top of the cylinders is an aluminum casting and is secured to the cylinder heads by means of studs. Inasmuch as the casting is quite long and any disalignment of the bearings is highly objectionable, the casting is first boiled to relieve internal strains, and it is then snagged and rough-ground. This is followed by three successive boring operations, and in the same setting the corners are broken and the bore is line-reamed. Next follow three milling operations, on the top side, the bottom side and the vertical shaft flange face respectively. The flange end is then finish-turned, faced and chamfered, and the small end faced-off to the right length. After the sides of the bosses are faced, sixteen 11/32-in. holes are drilled halfway through from both sides and then taper-reamed or counter-drilled. Next come a series of milling operations, including milling of the rocker arm clearance slots, form-milling of the sixteen-bolt bosses, profiling of the oil felt grooves and milling of the rocker-arm shaft seats. Six 1/4-in. holes are then drilled in the flange, the vertical shaft hole is rough-bored, finish-reamed and faced to gage. Next the various tap holes

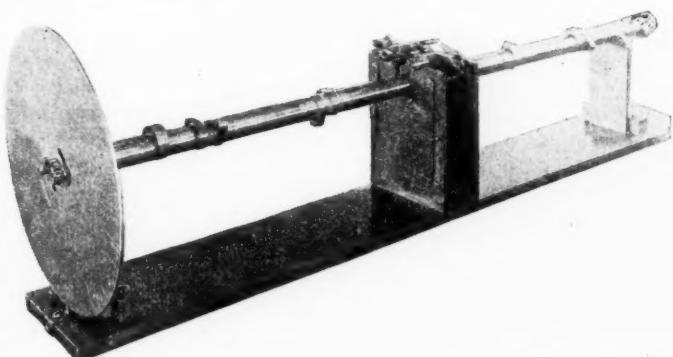
are drilled and tapped and finally the complete casting is line-reamed and finish-filed.

In assembling the engine use is made of special assembling stands with tilting beds to which the top half of the crankcase is bolted. The crankshaft is put in place, next the vertical shaft with its gearing and housing, the magnetos and pump are put on and the cylinder hold-down bolts are put into the case.

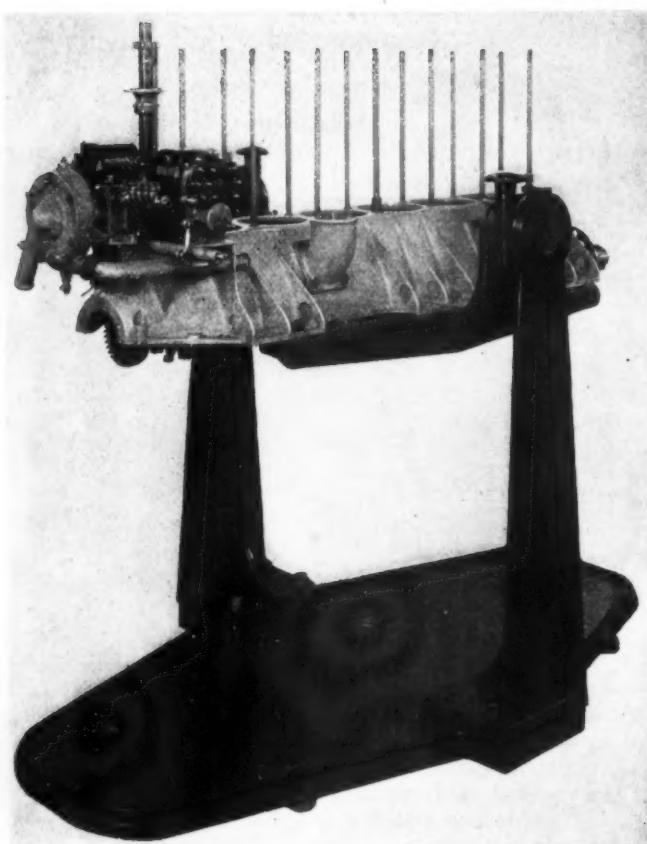
Following is the routine of passing the engines through the testing department. After having been brought in from the assembling room the engine is placed on the electric motor stand, oil is strained through into the lower crankcase and new oil put into the camshaft oiler. A pulley is secured to the propeller hub and a belt put over the pulleys on the electric motor and the engine. The exhaust manifold is put in place and relief plugs are substituted for the spark plugs so as to prevent compression in the cylinders. Connections are made from the magnetos to the spark plugs, which latter are not in the cylinders, so that the sparks can be seen. The electric motor is then started up and the engine is "run in" under electric power for a period of 12 hr. at a speed of 500 r.p.m.

Overhauling After Preliminary Run

At the end of this run, the engine, remaining on the same stand, is connected to the fuel tank. The oil is drained out of the engine and a new supply of previously used oil is put in. Testing spark plugs are put in, the magnetos are cleaned, the cable holder, exhaust pipes and propeller are put on and the preliminary power run of ten hours is started.



Testing camshaft for accuracy of timing



Assembling stand, with engine partly assembled

At the completion of this preliminary run follows the first overhauling. With the exception of the magnetos and crankshaft, all parts are taken down. They are

washed in distillate, the carbon is scraped from piston heads and cylinder walls and the valves are reground, after which the engine is reassembled. A system has been worked out for conducting this taking down and reassembling in the testing department in a methodical manner. The engines are placed on wooden horses or stands adjacent to parts racks which afford a place for every part of the engine. The different shelves of the rack bear signs and each part is always placed in the same position on them, so it is instantly at hand when wanted in reassembling.

Testing the Engine

When all connections are remade the engine is subjected to a warming-up run of $\frac{1}{2}$ hr. at 900 r.p.m. Then follows a full-load run for 6 hr., the load varying with the blade used, but the speed ranging around 1350 r.p.m. During this run readings are taken every half hour. Then the engine is throttled down as low as possible, which is generally around 250 r.p.m., is taken off the stand and again completely taken apart. In addition to washing the parts in distillate, cleaning the carbon from pistons and cylinders and regrinding the valves, the main bearings are now rescraped and the crankshaft journals polished. All parts of the engine are now assembled with the exception of the cylinders, which are being enameled.

After these return from the paint shop they are also assembled, the camshaft housing is put on and the valves are timed. The engine is then once more placed on the test stand, is thoroughly inspected and all parts are adjusted.

The final test is of 1-hr. duration, the engine being tested for high speed, low speed and to see that it works entirely satisfactorily before being shipped. It is then taken off the stand, the oil is drained off and the engine is washed. All unnickled parts are greased to prevent rusting and the engine is sent to the stockroom.

Book Reviews

ELECTRIC TESTING—STARTING LIGHTING AND IGNITION SYSTEMS. Book No. 6. By Harvey E. Phillips. Published by the Auto Electric Systems Publishing Co., Dayton, Ohio. Price, 40 cents.

In this book the phenomena occurring in an electric circuit when in proper order and when variously deranged are illustrated by means of hydraulic analogies. Simple tests of both the starting and lighting system are illustrated and described. The illustrations are particularly clear. Instructions are also given for maintaining the commutator and brushes and there is a page of symbols commonly used in electric work.

ELEMENTARY COURSE IN LAGRANGE'S EQUATIONS, By N. W. Akimoff, Philadelphia Book Co., Philadelphia.

Lagrange's equations form a branch of higher mathematics not included in the average college engineering course and which therefore is unknown to most engineers. In elementary mechanics are taken up problems relating to the motion of bodies under the action of various forces in single planes, and such examples as that of the trajectory of a projectile fired at various angles are familiar to every student of mechanics. Problems of dynamics become very much more involved, however, when, owing to restraint on the motion of the body, the latter cannot move in a plane. The instantaneous position of the body can then be expressed only by a system of three plane co-ordinates and the motion of the body by a system of three equations expressing the variation of its co-ordinates with time. Problems of dynamics in which there is motion not confined to a plane lend themselves especially to solution by means of Lagrange's equations. Of course the variation

of the forces with time of the nature of the restraints must be expressible in the form of equations in order to make a solution possible.

Mr. Akimoff's work aims to familiarize the student and engineer with Lagrange's method. Dealing in the first chapter with the general principles of dynamics, the author in succeeding chapters takes up successively Lagrange's equations for a particle and for a system, relative motion and oscillations. Throughout the book examples are given to illustrate the principles explained. The examples, however, for the most part are not taken from engineering practice.

The book may be recommended to engineering graduates of a mathematical turn of mind who are desirous of broadening their mathematical equipment. Although the treatment is styled elementary it requires considerable mathematical knowledge and concentration of mind to follow it. This, however, is inherent in the subject and not the fault of Mr. Akimoff's treatment.

Trade Literature Received

VACUUM OIL CO., Rochester, N. Y.—Pamphlet on the lubrication of the automobile, in two parts, the first part covering the lubrication of the engine and the second part the lubrication of the chassis; also a book entitled *Correct Lubrication*, in which are explained the different tests for lubricating oil, the symptoms of different engine troubles, etc. This book describes the different grades of Gargoyle Mobiloils and mentions the grade most suitable for each car, motor cycle, motor truck and tractor engine.

America Pledges Good Business

**Representatives of 500,000 Business Men Plan
Best Methods for Use During and After War**

THE opinions of 500,000 business men, representing 1000 chambers of commerce and commercial organizations from the forty-eight States of the Union, on various subjects relating to the war, are extracted herewith. These opinions or pledges of half a million business men were agreed to at the War Convention of business men held last week at Atlantic City. These pledges were agreed to after four days of war convention, addressed by three members of the Cabinet, by some of the leading manufacturers of the country, by leading financiers, by leading merchants, and by others of international reputation.

These opinions or pledges, as such, are beacon lights by which men at the head of industries can get their direction as to the course of events during the period of the war, and from which they can get some indication of the direction of events in post-war days. These pledges represent the consensus of opinion of thousands of the leading business men of the country. They should not only be read, but re-read.

Pledge 1—Labor Standards—“That during the present emergency employers and employees in private industries should not attempt to change the standards which they were unable to change under normal conditions before the war. And that such maintenance of standards is necessary for maximum production in all lines while the country is at war.”

Secretary of Labor Wilson was one of the leading speakers on this labor question and an entire session was given up to the consideration of labor problems. The meeting developed the fact that there was a suspicion on the part of labor that many manufacturers were making huge war profits and that labor was not participating as it should in these. On the other hand there was a suspicion among manufacturers that labor was making use of the exigencies of the present war to exact higher rates, etc., which it would not be able to obtain under normal conditions.

Pledge 2—Co-ordinated Government Buying—“That all war buying be assembled under the control of one war supply board, and that said board be given full power to procure war supplies to the best advantage to the government as to price, quality and delivery, and in a way to maintain essential, industrial life, without disturbing social and economic conditions; and that such board have the power to fix prices not only to the government but to the public on essential products and to distribute output in a manner to promote the national defense and the maintenance of our industrial structure; and that Congress be requested to pass such laws as may be necessary to give the President of the United States all the power necessary to concentrate in this manner the resources and industrial energy of our country towards winning the war.”

The War Convention developed the fact that at present there is competitive bidding between the government and private industries in government purchases and that this is largely due to lack of one board making all government purchases. At present one government department is bidding against another on war supplies. The convention favored a war supply board similar to the Munitions Board in Great Britain. The Munitions Board made up of business men has complete power on

price fixing and centralization of purchasing. Waddill Catchings, speaking for the Chamber of Commerce of the United States, declared that labor troubles are in many sections due to the government bidding against private industries. He said that the government will purchase \$2,000,000,000 worth of materials within the next year and that such huge purchases will naturally upset general business, but that with a war supply board such as recommended the disturbance to business would be the least possible.

Pledge 3—Business Patriotism—“That American business without hesitation pledges our government its full and unqualified support in the prosecution of the war until Prussianism is utterly destroyed; and that business will do all in its power to prevent waste of men and material and will dedicate to the nation every facility it has developed and every financial resource it commands on such terms and under such circumstances as our government shall determine to be just.”

The general subject of business patriotism was paramount and the sentiment was expressed that with many business interests there was real patriotism not only of the imagination but also of the pocket book, but that still there were too many business men who were patriotic when addressing their fellow citizens but entirely without patriotism when it came to making sacrifices in their business that would affect the earnings of the company. Too many business men were making the greatest amount out of war profits and not willing to share with labor or contribute as they should to supporting the war. Harry A. Wheeler, a Chicago banker, and founder of the United States Chamber of Commerce, summed up business patriotism when he declared: “Until the principles at stake in this war are closer to us business men than our individual businesses we will never be right with our government.”

Pledge 4—Future Liberty Loans—“That we urge business men of the nation to devote the same untiring work in the selling of the forthcoming issue of Liberty Bonds as they so patriotically devoted to the first issue, insuring its large over-subscription as an effective answer to the propaganda of our enemy both in their country and in neutral countries to the effect that our people are not unitedly supporting our government in its conduct of the war; and we urge employers to furnish every assistance to their employees in the purchase of bonds.”

Pledge 5—Daylight Saving—“That the plan of daylight saving as outlined in the Calder Bill be made effective as a war measure, and that Congress and the President be urged to take such action; that this daylight saving plan would conserve the nation's supply of coal and add to the productivity of many millions of workers in shop, mill and shipyard.”

Lord Northcliffe, head of the British War Mission in America, and who in such a position purchases between \$60,000,000 and \$70,000,000 each week, declared that daylight saving in England by advancing the clock one hour had worked out entirely successfully.

Pledge 6—Military Roads—“That the government take prompt action in improving our public highways, as they offer good, prompt and economical means to supplement transportation by rail and water.”

This action seemed necessary in order to keep the price of food stuffs down. Good roads permit of economical movement from the farm to the market of all farm products.

Pledge 7—Revising Fixed Prices—“That such board, or boards, as have the responsibility of so fixing prices of raw materials or commodities, that they shall afford opportunities to industries affected to present changes in cost of production to the end that such prices may be revised when necessary in order that the proper relation between such cost of production and such fixed prices may be maintained.”

It was the consensus of opinion that fixed prices are a necessity and shall be based on cost of production, and that the cost of various elements entering into such cost of production, including raw materials, labor and transportation, varies from time to time so as to require revision of fixed prices such as 23½ cents on copper, \$6 per ton on coke, and \$65 per ton on steel ship plates.

Pledge 8—Naturalize Resident Aliens—“That business men of the United States do all in their power to persuade resident aliens to take their stand upon an equality with our citizens for the defense of the United States by making application for citizenship papers.”

Pledge 9—Universal Military Training—“That the adoption of universal military training is necessary and essential to the present and future safety and success of the nation; and that no principle is more in accord with a republican form of government, no doctrine more truly democratic, than that which asserts that every able-bodied male citizen owes military service to his country.”

Pledge 10—Co-operative Economy—“That various trade associations co-operate with the Commercial Economy Board, and that all citizens shall make it their responsibility that economy boards are appointed in their local cities to assist in national economies.”

This pledge was worded so as to refer only to those at the War Convention, but we have taken the liberty of re-wording it herewith thereby making it apply to all organizations. The Commercial Economy Board of the Council of National Defense has accomplished much good. In retail store delivery in several cities the number of deliveries per day has been cut from five to two. Much waste in many ways has been eliminated, but this movement to reduce waste must be continued.

Pledge 11—Co-operative Export Trade—“That the Senate Committee on Interstate Commerce be asked to report the present bill known as the Webb-Penrose Bill to promote export trade and that the question of its passage be put to a vote before the adjournment of the present session of Congress and before American export trade is brought face to face with conditions which will follow the close of the European war.”

The Webb Bill, which has been up for passage for three years, but which has been persistently side-tracked, aims at giving the right of exporters to co-operate in their foreign trade. Our large manufacturers have feared the Sherman Law, which does not permit of co-operation in manufacture or merchandising and that the Sherman Law also restricted co-operation in export trade. Alva B. Johnson, president of the Baldwin Locomotive Co., declared that the Sherman Law is a false idol which we have been worshipping for twenty years and that it would not stand an industrial crisis such as the end of the war may bring about. England, France, Germany, and other governments had urged their manufacturers to co-operate in export trade and our manufacturers should be given similar privileges.

Pledge 12—War Service Committees—“That all industries not already organized with a war service committee organize

with such at the earliest possible moment; and that such war service committee be independent of any governmental committee; and that such committee be made up of representative men in the industry; and that in all matters pertaining to any given industry the government should deal with the committee wherever possible, leaving to it where practicable the proper distribution of all orders for materials.”

Such war service committees representing different industries are able to get the opinions of the industries on different subjects and thus are qualified to constitute a link of communication between the industry and the different government committees that may have dealings with such industry.

Pledge 13—Arbitration Board—“That the government create a federal board to be constituted equally of representatives of employers, employees, and the government, to which shall be referred all major disputes between employers and employees during the war; and that during the adjustment of such disputes there should be no interruption of production by lockout, strike, or other causes within the control of employer or employee; and that the decisions of the board should be accepted as binding by both parties.”

Pledge 14—Dollar Exchange—“That the United States government through its proper department take whatever action may be necessary to keep at parity the American dollar in every country of the world.”

Maintaining the American dollar at par with all countries of the world with which we have foreign trade would be a great asset. Everything should be done to keep the value of the dollar international. The present war has shown examples of how the unit of money in foreign countries has dropped below par, because of various conditions.

Pledge 15—Profiteering—“That during the war it is essential to the maintenance of sound industrial relations that there be no profiteering by producer, distributor, laborer or manufacturer.”

Cheating the Scrap Pile

NOW that the prices of all metals have risen to levels unknown during the past few decades the recovery of scrap metal of all kinds has become a very important problem. The scrap heap of the average manufacturing plant is no longer regarded as of no value, but is looked over carefully as to what parts could have been saved from it. The popularization of the oxy-acetylene welding process has permitted of reclaiming much of the material that formerly was thrown away.

Recently an engineer for an oxy-acetylene concern made an investigation in a Western mining field. At one big mine he found in the scrap-piles dollies and dies for drill sharpening worth \$9 each, which could be welded and put into service at a cost of about \$1 each. The mining company's purchasing agent was on the anxious seat, too, as to when he would be able to get more new material. It was found that the scrap heap would yield a 3 months' supply of good material in a year's scrap accumulation.

The various processes of welding have made it possible to reclaim an enormous number of machines and tools that formerly were sold as waste, and at a fraction of the original cost. Nowadays any kind of metal—steel, iron (both cast and malleable), brass, bronze, copper, aluminum, sheet iron, gold, silver and platinum can be welded, and broken parts made as good as new.

Internal Gear Axle Discussed

THE Russel Motor Axle Co., Detroit, has issued a pamphlet entitled “The Final Question,” in which the argument in favor of the internal gear form of truck axle is very lucidly set forth.

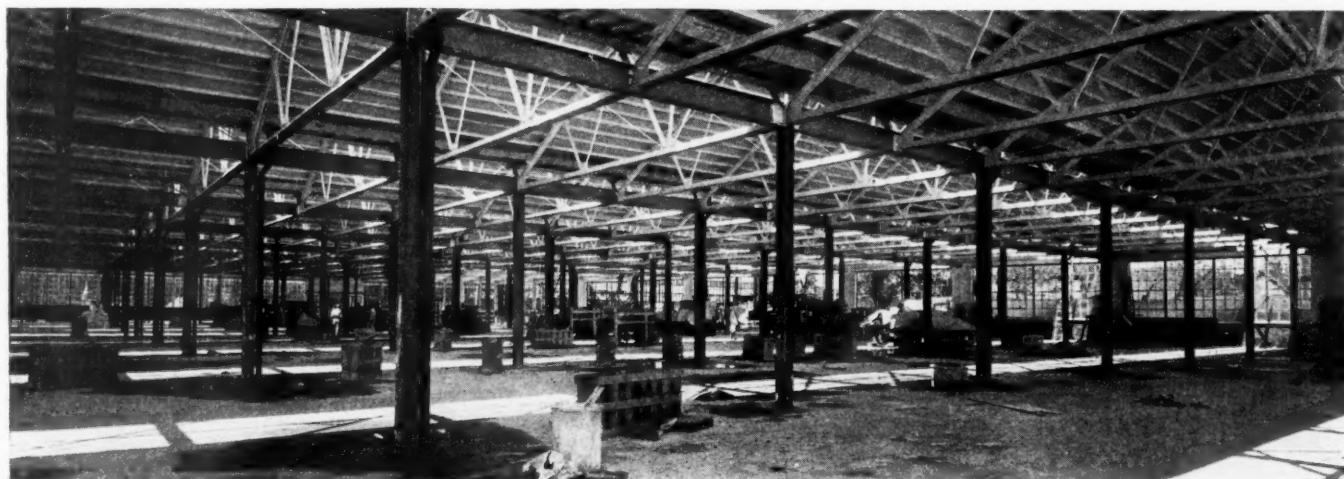
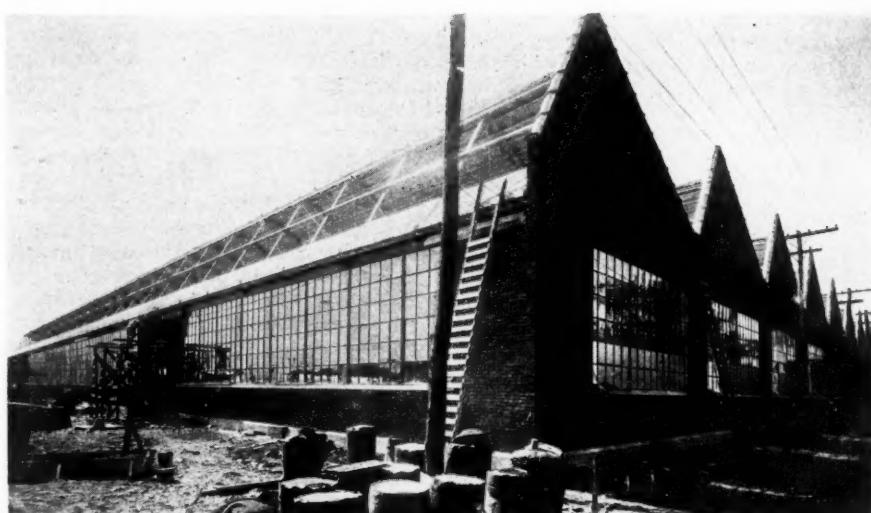
Special Truck Employed for Mine Rescue Work



THE accompanying illustration shows a White 3/4-ton truck and six members of the Mine Rescue Corps ready for quick aid to victims of mine disasters. Motor trucks are helping to reduce the suffering of injured and entombed miners following the periodic disasters in coal mines. The truck carries special equipment, such as fire extinguishers, safety lanterns, surgical dressings and instruments. A portable telephone is usually carried into the mine to enable the members of the corps to communicate with the surface workers. The truck illustrated here has been designed for the United States Bureau of Mines and will be used for educational work in the State of Washington until next summer and will then be placed in service in Seattle.

New Nordyke & Marmon Airplane Engine Factory

THESE two pictures, which are shown by permission of the Federal Bureau of Public Information, illustrate the new Nordyke & Marmon airplane engine factory as it appeared Aug. 15. On the right is shown the outside of the factory, looking southeast. Below is a view of the interior of the factory.



Fabricated Bakelite Materials*

Bonding Materials and the Principles of Their Action—Bakelite a Synthetic Product—Two Commercial Methods of Using It

By Ray P. Jackson

ORGANIC bonding materials may be roughly divided into three classes. First, materials which may be taken up by a solvent and deposited therefrom by the evaporation of the solvent; second, materials which may be used in connection with a solvent or thinner, but which depend for their final hardening mainly on the taking up of oxygen from the air or some ingredient carrying oxygen and thereby changing their chemical composition; third, materials which under the application of heat change their molecular structure and pass into a permanently hard state without losing solvent or oxidizing.

Classes of Bonding Materials

To the first class belong the various waxes, gums and asphalts. For example, gum arabic and glue take up water and harden by the loss of the water. Shellac dissolves in alcohol and hardens by its evaporation. Some other organic resins, such as the various gums, dissolve in turpentine, benzol or other solvents. The list in this class is long and varied.

The second class is represented typically by what are known as the drying oils, of which linseed oil and tung oil, more commonly known as China wood oil, are representatives. These oils when exposed to the air tend to absorb oxygen and congeal into a hard body not easily re-dissolved. It is an oil of this kind that forms the base of most paints and high class varnishes.

The third class has but comparatively few samples as yet, though no one knows how many may be possible. Bakelite, Condensite and other similar synthetic resins come in this class and it is to one of them and some of its industrial applications that we wish to call attention.

Derivation of Bakelite

Bakelite is a harmless and particularly inert material derived from the combustion of two substances noted for their activity and power so far as affecting organic life is concerned, namely: Carbolic acid, cresol or phenol, and formaldehyde. You are all doubtless familiar with carbolic acid, even though you have never had occasion to "open a bottle" when in a desperate mood. While there are various ways of obtaining it, phenol is essentially a coal tar derivative. Formaldehyde is commonly obtained by a special treatment of wood alcohol. The two when combined in the proper manner form a resin which in its primary state may be either solid or fluid, but in either case is essentially a soft resin, easily affected by heat and solvents. The effect of heat and pressure continued sufficiently long, however, is to carry the material over into a hard state not affected by ordinary solvents or temperatures that would ordinarily disintegrate a gum or resin. When in this condition Bakelite is but slightly affected by acids or weak alkalies. It will not burn at all readily but will char and burn slowly at temperatures in the region of 300 to 400 deg. C.

Bakelite itself, when hard-

ened, is much harder, stronger and more glass-like than practically any other organic material, and is peculiarly suitable as a bonding material with which to build up other bodies known as fillers to form a variety of fabricated structures.

There are two commercial methods by which it is utilized. One is to mold a mixture of Bakelite and a filler into accurately formed steel molds, the other to build up plates or tubes from sheets of material which have been treated with Bakelite in the form of a varnish. With the former you are doubtless familiar in the form of ignition distributor heads as seen on all battery and many magneto ignition devices.

Fillers and Colors

As used for this purpose the filler or body is wood flour or a very finely pulverized and prepared wood fibre. The different colors as black, brown, red, etc., are purely a question of dyes to improve the uniformity of appearance. A given manufacturer usually finds it best to standardize on one particular color. When properly molded this product has a high insulating character, will withstand temperatures considerably above boiling water and is practically free from shrinkage or warping. Hard rubber is the only other material which compares favorably with it, but hard rubber is very difficult to control in texture and has nearly gone out of use for this kind of work on account of that reason and because of its cost. Asbestos fibre is another filler commonly used. Asbestos adds materially to the strength, especially against shocks or blows, but detracts somewhat from the insulating strength. Such molding mixtures are now used for bonding small commutators. The usual mica is placed between the bars, but the whole commutator is put in a mold and formed bodily into a unit on a small tube mandrel ready to press onto the shaft. Being held securely cemented in place, each bar stays so put and high bars are unknown. Other filler materials, such as textile cotton fibre, will doubtless find uses in this connection as satisfactory methods for handling them are worked out.

The molding of Bakelite without filler in various semi-transparent forms is a special art not connected with the electrical industry. It may be seen in the form of pipe stems and cigar holders, bead work and jewelry resembling amber.

Bakelized Paper or Cloth

The other large field in which fabricated Bakelite is found is that of structures built up from treated sheets of paper or cloth. We will first consider the work based on paper.

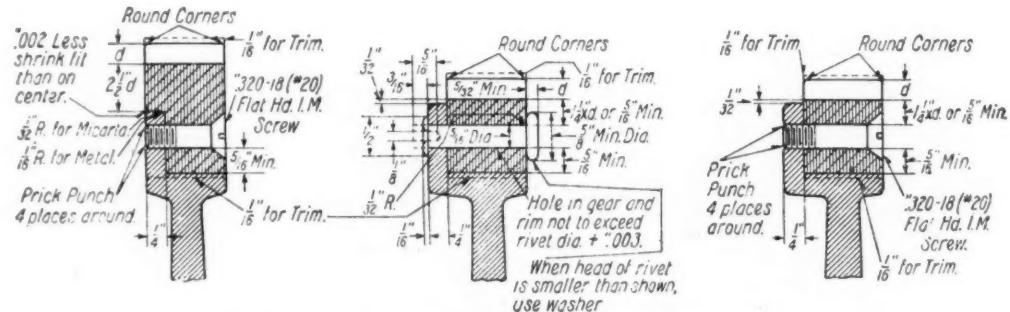


Fig. 1—Methods for mounting Micarta-D (21-D) gear rings

*Read before the Cleveland Section of the S. A. E.

A tough, strong paper made from wood fibre and commonly known as "Kraft paper" is passed through a bath of Bakelite varnish being treated on one or both sides and is then dried by passing up and down through a heated tower. This drives off the solvent in the Bakelite, but does not permanently harden it. The paper thus treated can then be rolled up and stored indefinitely. For making it into tubes or hollow cylinders the paper is treated on one side only. In forming into the tube the paper is slowly wound onto a mandrel or steel cylinder rotating against a heated plate or another heated cylinder. The Bakelite is melted just enough to make the various sheets of paper cohere tightly. When the tube has reached the required thickness the mandrel with the tube still on it is taken out of the machine and subjected for several hours to heat and air pressure to carry the Bakelite over into what is known as the "C" or infusible state. After cooling the tube may be pressed off the mandrel. The traces of loose paper that may sometimes be seen inside the tubes are not part of the tube proper, but remains of the wax treated paper put on the mandrel before winding to facilitate pressing the tube off the mandrel. The above covers the making of round tubes. If some rectangular shape is wanted the rolled tube can be pressed off before the final hardening and formed to the desired shape while warm, or may even be formed to shape direct from the loosely wound paper. While secured in such forms it may then be given the final hardening. Rectangular tubes, channel sections, V sections, etc., may be made in this way—the latter by sawing up lengthwise rectangular tubes. For automobile use such tubes and channels are well suited for carrying high tension wiring. In the electrical construction work generally such tubes are used for transformer insulation between iron core and primary and primary and secondary coils. There are a great variety of structural insulating uses to which it is suited and for which there is no good substitute.

Micarta Sheets and Plates

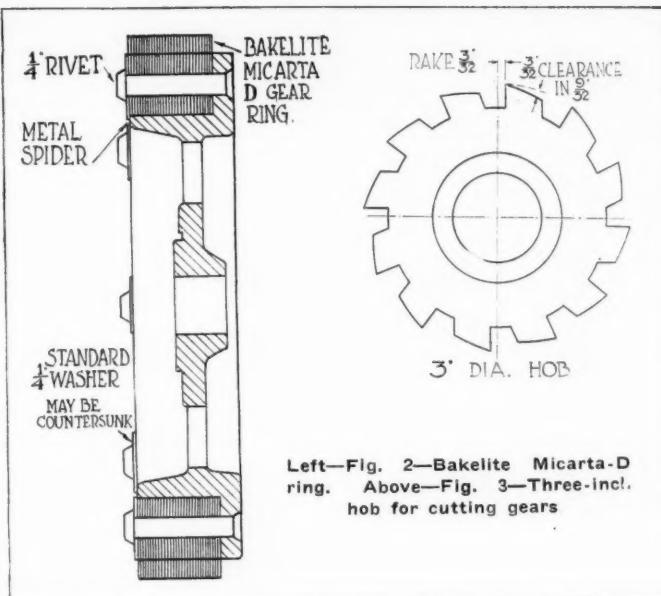
The other general method of fabricating this treated paper is to stack the sheets up loosely and subject it to great pressure between heated steam platens or press plates. This forms it into smooth sheets or plates having a polish similar to that of the metal separators used. This material having the trade name of 213 Micarta can be sawed, drilled and tapped. By proper handling it can be punched up to about $\frac{3}{16}$ in. in thickness. It can be produced in thicknesses up to about 2 in., but is commonly limited to $\frac{1}{2}$ in. or less. In a similar manner to the tube material it can, while in the warm but unhardened state, be molded into channel and V shapes and even into curved tube sections in two parts or two curved channels fitting together. Such sections make very fine protection for car wiring. In general this material finds its way into brush holder rings and other plate insulation in starting and lighting and ignition apparatus. It is also used for small timing gears in battery ignition of the magneto type.

The shredded refuse or waste from the Bakelite treated paper can be molded into a variety of solid forms. If various colors are mixed some peculiar decorative features are obtained which so far, however, have not been able to compete with wood. The little pellets suitable for valve tappets show what this product is like. The special virtue of these valve tappets are strength, comparative freedom from noise, and absence of distortion due to moisture.

Micarta Gear Material

We now come to the one use of a Bakelite product of most interest to the automobile manufacturer, that is the plate material made from cotton cloth or duck and Bakelite cementing varnish.

The method of producing this stock is essentially the same as that used in the case of paper plate. The product, while a good insulator, has no particular advantage for such purpose over the paper plate. Its chief and particular field is to make noiseless gears. While one is talking about insulation the automobile man has a casual interest centered chiefly on his ignition apparatus, but when one speaks about noise the car builder or engine manufacturer is likely to sit up and



Left—Fig. 2—Bakelite Micarta-D ring. Above—Fig. 3—Three-inch hob for cutting gears.

sharpen his ears and his pencil. Vibration and the striking of metal on metal are things he is always fighting. In this Bakelite product with a woven fabric imbedded in it, or—looked at another way—this woven fabric, every particle of which is cemented together with Bakelite, we have an organic gear material as lasting as cast iron, but having a comparatively low modulus of elasticity.

In the transmission of power by means of spur or bevel gearing the impact of the teeth going into mesh has a great tendency to produce noise. The amount and tone of such noise depends primarily on the character of the materials from which the gears are made. Steel meshing with steel or iron at high speeds produces vibrations which cause a loud, piercing and often very disagreeable sound. Brass meshing with steel gives a sound of lower pitch and less piercing in tone. The brass having a modulus of elasticity less than half that of steel, flexes or "gives" more at the instant of impact and thus decreases the sharpness of the blow.

A non-metallic material having a much lower modulus of elasticity than either steel or brass, gives a further reduction in noise. A non-metallic material, however, in order to be suitable for gears, must have a mechanical strength sufficiently high to withstand the stresses involved without requiring an unduly wide gear face. It must be hard enough to wear well when properly lubricated and must not shrink or swell from oil or moisture or heat nor deteriorate in storage. It is desirable that the teeth of the gear should be able to withstand the service requirements without metallic reinforcement at their ends in order that the two mating gears can be made of equal width of face and so obtain uniform wear across the width and avoid clashing of metal to metal, in case of end play of one or the other of the gears.

The material referred to previously and known as Bakelite Micarta D meets the above requirements. It is vermin, moisture and oil proof and will withstand temperatures up to that of boiling water.

Physical Properties of Micarta Gears

The following physical properties of this gear material have been determined by careful tests:

1. Tensile strength, parallel to laminations—10,000 lb. per sq. in.
2. Compression strength, perpendicular to laminations—35,000 lb. per sq. in.
3. Compression strength, parallel to laminations—17,000 lb. per sq. in.
4. Transverse strength, maximum fibre stress parallel to laminations—17,000 lb. per sq. in.
5. Transverse strength, maximum fibre stress perpendicular to laminations—17,000 per sq. in.
6. Coefficient of expansion per in. per degree Centigrade

(Continued on page 563)

Small Power Loss From Holley Kerosene Vaporizer

Detail Improvements Enable 88 Per Cent Gasoline Power on Kerosene—Starts on Kerosene After 30 Sec. Gasoline Running

ONE of the most important points brought out at the recent tractor demonstrations at Fremont, Neb., was the fact that all of our manufacturers engaged in this line have not succeeded in grasping the principles underlying the successful use of kerosene. In view of the fact that the Holley kerosene carburetor as employed on the Ford tractor has been in use in small numbers on two different types of engine covering a period of two years, some of the underlying features of this device will be of interest. It might be stated that as a result of the performance of this instrument during the experimental period, about 15,000 are now in process of manufacture. The British Government after having made a series of tests on different types of instruments has specified this vaporizer on four different tractors, and a factory has been built in Coventry to take care of the production in Europe of this vaporizing system. The Ford tractor is the only American-made tractor of the four, the other three being British types.

Probably the most notable point of departure of this system from the practice followed in other devices is the method used for shunting the heat, which enables the efficient use of the different fuels under different temperature or conditions.

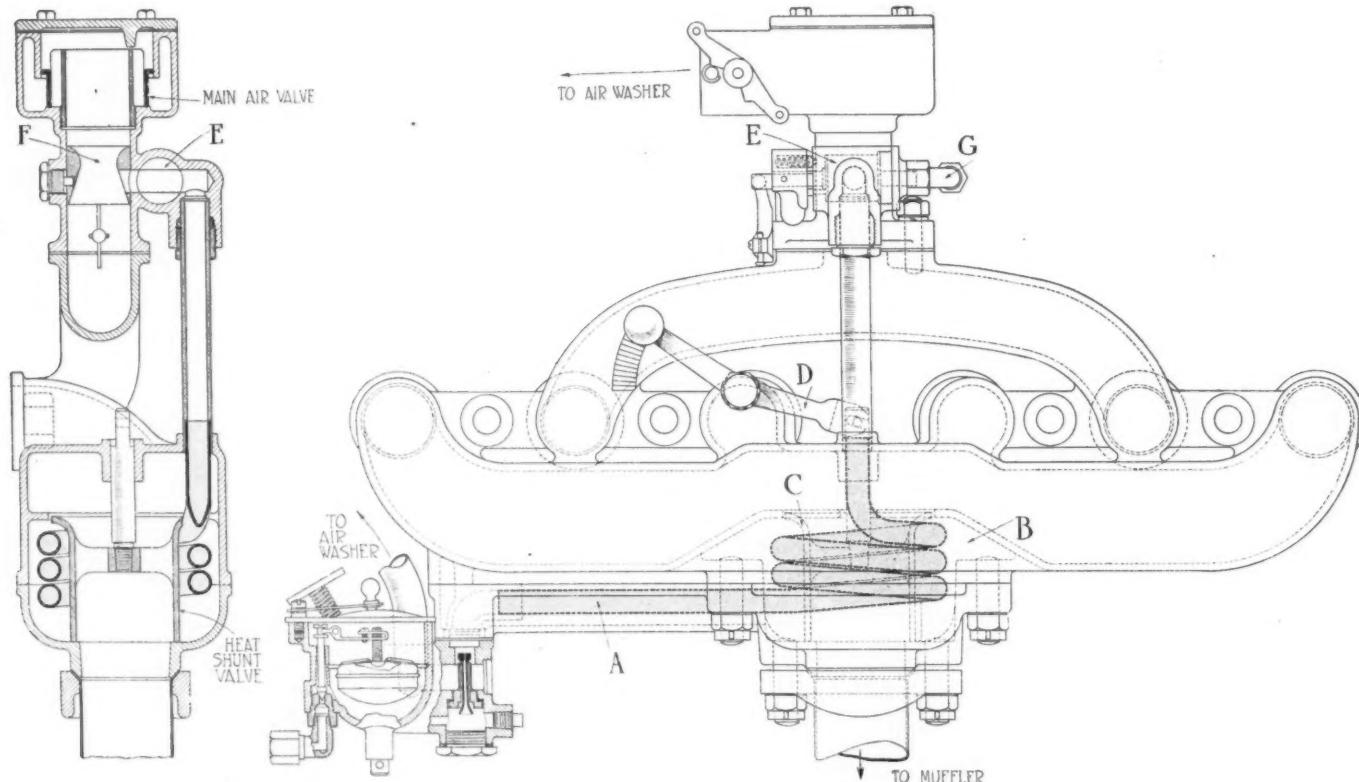
Another point which should be noted in the Holley system and which is here described, is the use of the thin-walled brass tubing for vaporizing the fuel. This is made as light as it is commercially possible to obtain it, and by means of the rapid flow of heat through and around this thin tubing it is

possible to use one float chamber and to shift from gasoline to kerosene in from 15 to 30 sec. after starting.

One of the questions which are continually being raised is whether it is possible to use the present type of engine with kerosene; that is, must the engine be entirely redesigned or is it possible to use the types which we have developed for gasoline, except that kerosene is employed for fuel? It has been the experience of the Holley company that slight alterations are necessary. The compression can vary from 45 to 70 lb. absolute, according to the efficiency of the radiator and the thoroughness with which hot spots are eliminated. On the average engine as designed to-day a compression of about 55 lb. represents what can best be used with kerosene.

While the system is constantly being improved as to brake horsepower, at the present time there is a loss of 11½ per cent in maximum output as between the standard gasoline carburetor and the kerosene carburetor. On the other hand, the pounds of fuel per brake horsepower-hour in actual use is generally a little better with the kerosene vaporizer than it is with the gasoline carburetor. The drop in horsepower, which totals 11½ per cent, is made up of two items, about 7 per cent being ascribed to the slightly lower compression used and 4½ per cent to the higher mixture temperature as compared with gasoline.

The amount of loss is being cut down gradually as improvements of the device are perfected, and these losses can be reduced also by the connection of either an air washer, water injection, an exceptionally efficient radiating system, or by a



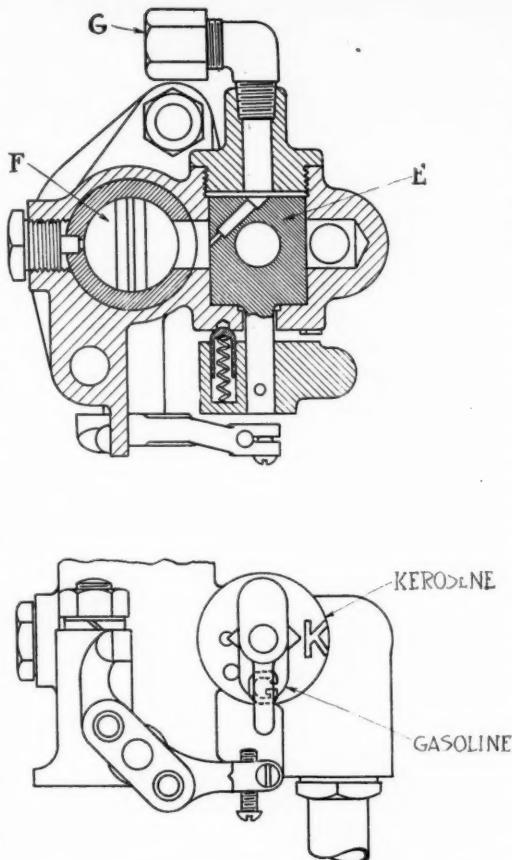
Holley vaporizing system for kerosene, showing the method of conducting the primary mixture through the vaporizing coil and the method for controlling the amount of heat used to vaporize the primary mixture.

combination of all three auxiliaries. Regarding the uses of water injection, of which much has been told during the past few years, it has been found that in practical service the result of water injection is to provide a cooler engine and one which does not show the effects of carbon so readily as when the water injection is not used. According to George Holley, when the water injection is employed the indicator card of the engine undergoes a change in characteristics, particularly in that the initial, or explosion, line does not go up so high as with a dry charge, and with the water injection the expansion curve is fatter, so that while the area of the card representing the useful work is not materially altered, if it is changed at all, the engine is nevertheless operating under conditions which make it less affected by carbon, thus reducing the tendency to knock and, correspondingly, giving more uniform bearing pressures during the work stroke without the hammering tendency which might otherwise be apparent.

The primary principle behind the design of the Holley kerosene vaporizing system is that it is possible to handle kerosene efficiently once it has been completely vaporized beyond the point where there is any tendency for it to "collect"; that is, where there is no tendency for minute invisible globules of the heavier products to collect into larger globules, which would tend to present to the influence of the heat of combustion a small superficial area in comparison with volume, thus rendering the mixture in a condition where cracking of the fuel will take place, and combustion generally be inefficient. Experiments conducted by the Holley company bear out the fact that once the kerosene has been thoroughly vaporized and mixed with a sufficient quantity of air to take the vapor by means of heat applied in the proper manner, it is possible to carry the charge several feet without experiencing the phenomenon of collection commonly alluded to as condensation and which interferes with combustion.

In studying the description of the device it will be seen that Holley takes the kerosene and puts it into the proper vaporized condition by mixing it with the correct percentage of air to take care of the kerosene vapor after it has been formed, and by means of heat applied in a progressive degree converts this primary mixture of kerosene and air into a mixed vaporous condition, which avoids the difficulties due to collection of the heavy fuel globules. This principle, borne out in practice, is shown by the fact that this system is applied to engines where the manifold and intake gallery are of considerable length. If the kerosene were not completely vaporized, the long intake would be incompatible with good combustion, because of the tendency for the conglomerate products with a high boiling point to collect and interfere with efficient combustion.

The farmer using the tractor, or the driver, or any of the other members of industries not closely allied with the automotive trades have a very reliable check on the performance of the kerosene vaporizing systems in the simple expedient of watching for smoke. The smokeless combustion of kerosene is wrapped up very intimately with the perfected vaporization of the mixture. A mixture which collects before combustion is a smoke producer; one that enters the cylinder in a vaporous or semi-gaseous condition will not smoke. The fact that the Holley vaporizer used in connection with the Ford tractors during the experimental period works without producing smoke is illustrative of the advantage of a complete prevaporizing system.



View through two-way valve, showing how change is made from the gasoline used for starting to kerosene used for running. There is no float chamber necessary for the gasoline

It must of course be remembered that smoke is not always caused by the kerosene, but it is sometimes a result of the use of an over-supply of lubricating oil. In cases of this kind it takes a man who has been working with the particular device to tell the differences between kerosene smoke and the lubricating oil smoke, as the difference in color is not always sufficient to be detected.

On the particular type to be described there is but one float chamber, and this is for kerosene. The gasoline for starting is admitted by means of a mixing valve or jet, which is only in operation for a short time and which corresponds very closely to the choke tube used on gasoline carburetors for starting purposes. The kerosene enters the float chambers and is controlled by means of an ordinary type of float mechanism.

From the float chamber the kerosene passes through an orifice controlled by an adjusting needle valve to the top of the jet, where it is atomized by approximately 10 per cent of the total air required for combustion. This action of atomizing is done by the ordinary type of spray nozzle, the air being induced by the suction of the engine.

The mixture of atomized fuel and air is then drawn through the vapor tube A in the heater chamber of the special exhaust manifold B, where the fuel is vaporized in its passage through the coiled tube. The relatively rich mixture is heated progressively higher in temperature in its

passage through the vapor tube, and by applying the heat at progressive stages deposits due to decomposition products are avoided.

The temperature of the rich vapor can be regulated by means of the shunt valve CC' controlled by the lever D, by means of which more or less of the hot exhaust gases can be caused to come in direct contact with the vapor tube, thereby compensating for variations in fuel or operating conditions, such as a cold wet day and a dry hot day. From the heater chamber the vapor tube issues and is connected through the shifter valve E to the venturi tube in the mixer chamber F. The shifter valve E will be more fully described in what follows.

At the venturi tube the arch vapor is diluted with the additional, relatively cold air required to form a combustible mixture. In other words, this is the point where the action of the ordinary carburetor is paralleled quite closely, with the exception that instead of fuel and air being mixed, a relatively rich mixture of fuel plus 10 per cent of the necessary air is admitted in place of the fuel alone, and in addition the other 90 per cent of the air required is supplied. The additional air required is admitted through a special form of air valve which governs the air admitted in accordance with the throttle position and the requirements of the engine. After the mixture of rich vapor and cold air has taken place the combined mixture passes the throttle into the inlet manifold and thus enters the engine.

The shifter valve E performs a double function. In one position it serves for starting purposes using gasoline as fuel, at the same time closing off communication between the vapor tube and the mixer chamber. It is to all intentions a simple two-way valve which in one position allows the suction of the engine to fall on the starting generator in communication with the gasoline reserve tank and in the other position is in communication with the coil vaporizing tube previously described.

The gasoline for starting is supplied from a small auxiliary tank connected at G to the shifter valve housing.

French Transport Service Highly Organized

Part II

Care Taken To Keep Trucks Always Busy—Vehicles of All Kinds Handled in Groups—Three Main Divisions Care for Transport of Materials, Food and Men

By W. F. Bradley

*Special representative of THE AUTOMOBILE AND AUTOMOTIVE INDUSTRIES
with the Allied Armies*

A GROUPEMENT repair department is one of the most interesting features of the automobile service at the front. The plant comprises a twin-cylinder gasoline engine and dynamo furnishing current for driving a lathe, a milling machine, a drill press, and an emery wheel. The power plant and the emery wheel are on a two-wheel truck trailer, solidified by means of props at the four corners, and the lathe, milling machine and drill press are on a similar trailer located by the side of the first. There is also a hydraulic tire press carried on a strong four-wheel trailer capable of handling the band tires used by all the trucks in service with this groupement. To secure a solid foundation pits are dug to receive each of the four wheels and heavy blocks of wood are placed under the frame of the trailer.

A repair camp of this nature is usually pitched within a slight clearing near the edge of the wood, so as to give the men the advantage of shade in summer, and also to hide them as far as possible from the observation of enemy airplanes. The two trailers with power and tools occupy a central position in the clearing, with around them, in suitable positions among the trees, a series of twenty or more trailers, each one fitted up to carry stores, or in some cases used as an office. The groupement repair shop is the first important unit in the field to carry a large stock of spares; it uses them for the vehicles brought to it for overhauling and also distributes them, on order, to the groups and sections to which it is attached.

System of Handling Spares

It is necessary to point out that the remarkably efficient method of dealing with spares and general stores has been evolved under full war conditions. In 1914 automobiles had never been used for war purposes in sufficient numbers to cause such an organization as this to be thought of. The system which keeps all spares out of the hands of individual drivers, reduces the parts handled by section chiefs and heads of groups to a minimum, and maintains a very complete supply with the groupement, ready to be handed out on immediate requisition, has been found to be the most practical and the most economical.

Under all the excitement and unforeseen contingencies of war, there are plenty of opportunities for waste and extravagance if a sound system is not established; at the same time a too rigid system would cripple the usefulness of the transport service by keeping vehicles unnecessarily off the road. The groupement repairshop re-

ceives its supplies from a central store in the interior of France. As an example of how this was done, I was shown a parts catalog of Pierce-Arrow trucks, as this was the make handled by the groupement visited. Every single item which goes to the make-up of a Pierce truck figured in that catalog under its French designation and with its factory catalog number. Opposite the part were parallel columns showing the number of such parts which should be maintained (1) in the hands of the individual driver, (2) in charge of the section mechanic, (3) in charge of the group mechanics, (4) in the groupement stores. Columns 1 and 2 frequently showed a blank; column 3 was often filled and column 4 always carried some number.

Keeping Track of Parts

From this book the officer in charge of the groupement led me to card files carried on one of the trailers. Here, in uniform size boxes were found a set of multi-colored cards, one color being for engine parts another for transmission, another for final drive, another for engine accessories, such as ignition and carburetor, etc., and every part composing the truck having its own part. At the head of the card was the name and number of the part and the maximum and minimum number of such parts to be kept in the groupement stocks. Below, in two parallel columns, were the numbers of parts received and given out, together with the dates and the number of the order. At intervals of three days the storekeeper balanced the cards, and if the stock had fallen below the minimum indicated at the head of the card made out a requisition for more such parts to be sent up from the central supply department in the rear. Briefly, the system is that adopted by all American banks for clients' pass books, and recognized as giving the most accurate control with the least amount of labor.

Under such a system as this the value is seen of dividing all spares into special and general. General spares, such as bolts, nuts, washers, cotter pins, etc., are given out by the kilo and do not need as close a supervision as magnetos and carburetors, which incidentally are always attractive to certain classes of mechanics and have a habit of disappearing if not kept track of.

The method of carrying spares is, of course, quite different from that adopted in any civilian organization, for in this latter the question of mobility has not to be considered. The central supply department is responsible for the packing of the parts in special boxes which will occupy the minimum of space, give the greatest

accessibility and prevent all breakage no matter how roughly the boxes may be handled. This, in itself, has called for a considerable amount of study and frequent modifications in order to get the best results. One make of truck "chews up" timing gears at regular intervals; on another make such gears never need touching except in the case of a road accident or damage by shell fire. These conditions have had to be learned under war experience and provided for accordingly.

Spares of the bolt and nut, washer, cotter pin and rivet variety are carried in series of drawers mounted immediately over the axle of the two wheel trailer. There are two sets of such drawers, back to back, and thus accessible from each end of the trailer. These drawers are permanently secured on the trailer and are each provided with a lock. On receiving an order to move, the drawers are locked, some of the lighter and more bulky spare parts boxes placed on the two ends of the trailer, the canvas end screens let down and fastened, and the trailer hitched up behind its truck.

Groupement Repairshop

The groupement repairshop is qualified to undertake the entire overhaul of individual trucks and touring cars. A section or group mechanic, for instance, is not expected to lift an engine right out of the frame, reline the bearings, change rings and wrist pins, etc. But a groupement repairshop must do all this, the trucks being sent in for such overhauls at regular intervals—compatible with military activities. In one of the groupements visited, American trucks were found stripped to the bare frame members and steering gear. By means of tripod and block and tackle a big 5-ton Pierce-Arrow engine, one of the largest power plants handled at the front, was lifted out of the frame and placed on a stand for complete dismounting; the gearbox and rear axle had been treated in the same way. Although the power-driven machinery is under permanent cover, much of the repair work has to be done in the open air, or with no more protection than a tarpaulin stretched by ropes from convenient trees.

The officer in charge of a groupement repairshop possesses a mechanical control over the whole of the two or three hundred trucks and touring cars for which he carries out repairs. He knows, for instance, if the drivers of one section are more destructive or show a greater number of accidents than those of another. He can compare the work of the section and group mechanics, he knows the tire mileage for each section and group, and he knows the proportion of defective tires supplied by respective makers. According to the officers in command, tire mileage in the war zone does not average more than 6,000 miles on driving wheels (these figures were given for Pierce-Arrow 5-ton trucks). Every tire manufacturer gives a guarantee of minimum mileage, and if this mileage is not attained the tires are returned to the rear for expert examination and report, and ultimately a claim on the manufacturer. Judging from observation, the quality of tires furnished at the present time is inferior to that of earlier days of the war. Quite an important proportion of the tires developed defects before the treads showed appreciable wear.

The mobility of the three repair departments described is variable: the section repair outfit can change its base at a moment's notice; a group repair outfit can get under way in an hour; a groupement being a big establishment, with seven to twelve service trucks, about twenty trailers with tools, spares, documents, etc., is obviously not intended to strike camp at very frequent intervals. After one of the recent advances of the French army,

however, the groupement workshops were all packed up and on the road in exactly six hours after the order had been given. Considering the section as having its headquarters five miles behind the front line positions, the group headquarters would be eight miles in the rear and the groupement from ten to twelve miles behind the lines. These distances, however, are decidedly variable.

These automobile organizations in the field are undoubtedly skilfully handled by men who are determined to get the maximum efficiency at the lowest possible cost. In an organization so complex that possibilities of waste are inevitable, it is only justice to set on record that the French officers seek efficiency and economy just as keenly as any civilian haulage contractor who is out for profits and profits only. Trifles often indicate the general tendency. Thus on every touring car there is a notice on the screen in front of the driver stating that national interests demand fuel economy, and that it is up to him to avoid waste when filling, and to avoid running the engine when the car is at a standstill. Truck drivers are impressed by an appeal which can be translated roughly as follows:

"This truck is worth \$3,000; the nation shows its confidence in you by entrusting you with such a valuable piece of machinery. Naturally, as a French soldier you will not abuse that confidence."

While appealing to the best instincts of the men, the authorities are not satisfied with a mere appeal, but exercise a control hardly less effective than that of a metropolitan motorbus company. Guesswork, approximation, accident, are reduced to a minimum in the truck services at the front. It is known how much gasoline and oil a truck should consume, how long its tires should last, how often it should visit the repair shop. How this control is exercised is matter for another story.

General Revision Repair Park

Although the groupement repair shop is the last and most important organization in the field, there is still another in the war zone, from thirty to forty miles back of the lines. This is the general revision repair park established to handle complete sections of trucks. One such park employs 600 men, of whom 360 will be professional and skilled mechanics, and the remainder soldiers of no particular ability. A park with this staff will turn out 200 trucks a month, of which 150 will have been completely overhauled. Except in cases of road accident, damage by shell fire beyond the ability of the groupement repair shops, and officers' cars needing important body repairs, the revision park only takes in complete sections or groups of fifteen to fifty trucks, all of one make, or model. When trucks are sent back to the revision park they are permanently lost to the section with which they have previously served, for they are out of commission for several weeks, and in the interval have been replaced by other vehicles. Thus they go forth, after revision, to whatever section may have need of them at that particular time. When individual trucks are brought in, usually by reason of accident or careless handling when far away from their own base, the drivers are retained until the repair work is done. Usually these men are given more than a normal share of fatigue duty, merely as a salutary measure against visits to these parks. When complete sections are sent in, the trucks are usually put on the train and are unloaded right in the grounds; they are not accompanied by their drivers.

A revision park is a permanent establishment with a temporary foundation. There are about a dozen such establishments back of the French armies, in towns within the war zone but sufficiently far removed to re-

ceive nothing more than an echo of the fighting. Only in case of an unusually important advance would it be necessary to change the location of a revision park, and even then adequate warning would be given. In these parks there is a close approximation to factory conditions, with the difference, however, that the staff has to erect its own shops, with the knowledge that at some date they will have to be pulled down and thrown away, and that the entire staff must be housed and fed. Although all the men are soldiers, the working conditions are no different from those of any civilian factory. The men feel that they are working as mechanics and not as soldiers, and for this work they are receiving the army pay of five cents a day; other men, doing exactly the same work, but who happen to have been demobilized and sent to the automobile factories at the rear, are receiving the standard wages of 25 to 35 cents an hour. This raises a very delicate problem, for it is no easy task to maintain output and keep up a high standard of efficiency with very little incentive and with the demoralizing knowledge that other men are doing the same work under so much more advantageous pecuniary conditions. Because of this, the suggestion has been made to put on a civilian basis all such establishments. It requires more patient enthusiasm to carry on such work day after day than to take an active part in the military operations at the front. Credit must be given to the French army mechanics for the good spirit they have displayed in duty of such a monotonous nature; the officers, too, are willing to recognize that the men are, in reality, more mechanics than soldiers, and invariably take particular pains to see that their food is entirely satisfactory and housing good. Although the majority of the men sleep in camp adjoining the park, permission is readily given to lodge in town when the men desire it and the service is not interfered with thereby.

One revision park, which is typical of the others, had been established in a grain warehouse in a town thirty-five miles back of the lines. The town supplied electric power, but a dynamo and electric motor had been fitted as a precaution, and all the power driven machinery—lathes, milling machines, drill press, saws, etc.,—had been erected in the permanent building. Beyond this, on vacant ground, had been erected long series of temporary wood and canvas sheds to be used for dismounting and as fitting shops.

600 Trucks Always on Hand

To keep working on a satisfactory and economical basis, it was considered necessary to always have 600 trucks in hand. These would comprise various makes, but an attempt was being made to limit each park, as far as possible, to two important makes, and to group six or seven small and little known makes in one park specially equipped for dealing with them. While the obtaining of spare parts is not really a difficult problem, automobile factory organizations have all changed to such an extent that there is inevitably a certain amount of delay in obtaining parts required.

The great majority of trucks brought into the Revision Park being intended for a complete overhaul, motors are first stripped of their magneto and carbureter, and then the entire chassis disassembled into its individual components, the motor, gearbox, steering gear and rear axle going to their respective departments. Frames are examined with a view to replacing any loose rivets or repairing if any fracture has developed, and are then placed on specially designed adjustable trestles, which will carry six frames superimposed.

It has been found a wise precaution to remove the car-

bureters and magnetos as soon as convoys are received at the revision park, otherwise these accessories are apt to disappear. Every magneto is examined by an expert, repaired if necessary, is tested by being run at speed, and then sent to the stores. Carbureters are treated in the same way.

Application is made for a magneto and carbureter when the motor reaches the assembly shop and is ready to go through to the test bench; the motor goes into the chassis with the magneto and carbureter used on the brake tests. In all the fitting shops men work in teams of nine under a chief mechanic; laborers are not permanently attached to any one group, but are moved about from group to group, at the discretion of the chief of the section. In each of the various sections graphs are prepared every five days showing the output not only of the entire section but of the individual teams working in that section. Thus the respective values of the teams is ascertained, and at the same time the general management is immediately aware if there is a falling off in the output of any one section in relation to the whole. Completely assembled, the trucks pass through to the test department, where they are tested on the road; after this they go to the paint shop, then to a park to await their turn for delivery. As only complete sections are received from the front, so only complete sections are delivered to the armies.

Revision Park for High-Class Work

A revision park has to handle a rather important quantity of high-class bodywork for which the groupement and sectional repair shops in the field are unfitted. Although generally satisfied with a dull gray finish, staff officers demand really comfortable closed cars with first class upholstery. Usually these cars have been produced in the first place by the leading European bodymakers, and to maintain them in condition calls for the services of an important number of really skilled body hands. Truck body repairs, on the other hand, are very simple and capable of being handled by any carpenter.

There is a picturesque combination of modern efficiency and makeshift about a revision park. To turn out the quantity of vehicles required in the limit of time considered necessary, it is essential to adopt modern factory methods; yet war conditions require that the staff shall get along with all kinds of expedients. Only the machine shop is a permanent building and even that not designed for the purpose for which it is being used. Most of the fitting shops are temporary buildings about 80 yards in length by about 25 in width lightly built of steel frames with a canvas roof and detachable wood and canvas sides. Advantage is taken of the main framework of the building to carry an overhead rail and crane down the entire length, and from shed to shed. In this way chassis units can be taken from the yard where they are disassembled to the bench where work is to be carried out on them with a minimum of labor.

Although the revision park is the last of the automobile repair organizations with the army in the field, it is necessary to mention still another which has a connection with the fighting forces. This is a depot far in the interior which receives the absolute wreckage of the war. Automobiles sent to this depot never return to the front. If they are capable of repair, they are either sold or hired to army contractors. If considered unfit for repair they are dissected, and the parts which might possibly be used as spares in other vehicles are classified and put into the shops for ultimate delivery to units in the field. By carrying out this system on a big scale it is possible to save thousands of dollars on spares.

Lima Garage Efficiently Operated

Largest in Peru and Accommodates 100 Cars—Facilities for Manufacturing Parts and for Turning Out Completely Rebuilt Cars



Exterior of Pancorvo garage, giving an idea of its size. This garage has a special entrance and exit. Cars going to the second floor are taken up by means of an elevator

EFFICIENCY to the first degree marks the activities of the garage owned by Pancorvo Bros & Co., Lima, Peru. This garage is the largest and best equipped in that country. It is housed in a commodious building, ample enough to take care of all the business received, and its different sections are so arranged as to make for what is so commonly known in the United States as efficiency. It has two stories, with a frontage and depth each about 150 ft. A noticeable feature is the large elevator for conveying cars to the upper story. The only other known elevator in Peru is in a large German department store. A roomy cellar in the front of the building serves admirably as a depository for gasoline, etc.

The main floor has a rectangular arrangement, along three sides of which, in double rows, are asbestos-lined compartments with accommodations for sixty cars. At present, some 100 cars are garaged, thirty-five of which are undergoing repairs. Quick repairing jobs average from fifteen to twenty per week, while big jobs, which entail complete dismantling of cars for thorough cleaning and general overhauling, painting, varnishing, etc., average from twelve to fifteen monthly.

An interesting feature of the work is the complete construction of car bodies from raw materials. Motors, and extra parts not easily or economically manufactured, are purchased, usually from catalog, in order to turn out a "new" car. Facilities for duplicating almost any part of any make of machine—in fact, for practically manufacturing entire cars—are afforded by up-to-date equipment in the way of a machine shop, foundry, nickelizing plant, etc. In this garage

in a country so backward in manufacturing knowledge and experience, one's interest is held fast while observing the various steps in the manufacturing processes whereby raw materials become finished, often complicated parts of automobiles. In short, employing parts of old cars no longer fit for use, buying other parts from catalog, making others in the shops, combined with reconstruction and artistic, tasteful upholstering of carriage interiors, fine looking cars are turned out, which render most satisfactory service.

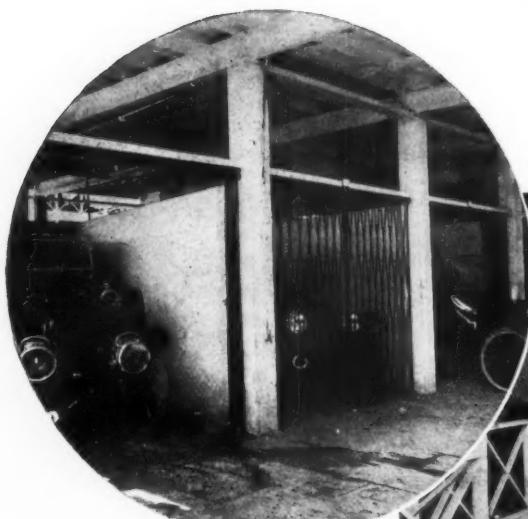
About sixty-five men are employed, distributed as follows: Office, three; machine shop, fifteen, three of them all-night workers, all constantly occupied; electricians, two; making fenders, mud guards and lamp frames, two; vulcanizing tires, two; upholstering carriages, three; painters, five; mechanics, nine, three chief mechanics, each having two helpers; one mechanic with two helpers for Fords exclusively; carpenters, one chief with two helpers; one carpenter for exclusive body work; one carpenter for general work, small jobs; two men for charging lamp batteries, working every day in the week; three in the nickelizing plant; car-washers and cleaners, six; janitors, two.

All the equipment is of American manufacture. An ample stock of accessories, tools, etc., etc., is all of American production.

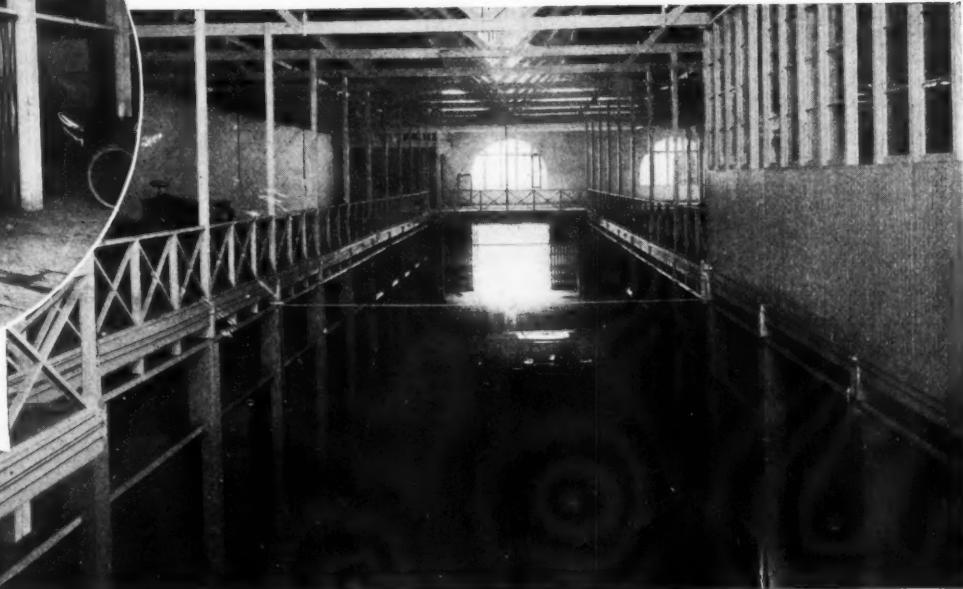
Among the cars now garaged are the following: Ford, Cole, Locomobile, Hudson, Studebaker, Chalmers, Rambler, Regal, Renault, Panhard-Levassor, Fiat, Bianchi, Lancia, Minerva and Delaunay-Belleville.

There are about 500 automobiles in Lima, a fair proportion

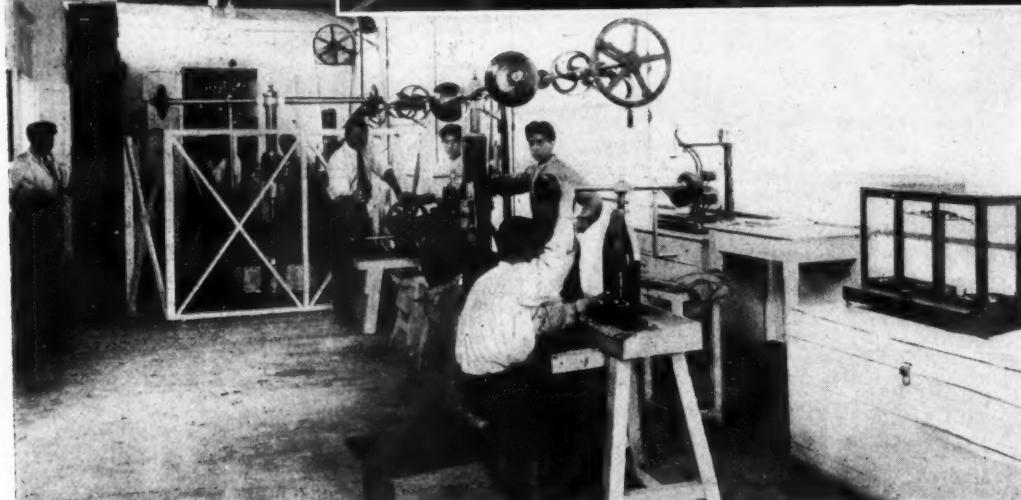
**Views of Largest Garage in Peru, Where
100 Cars May Be Stored. The Garage
Is Efficiently Managed and Modern
Methods of Repairing Are Used**



Method of storing cars in Pancorvo garage. Each car has its own stall and is locked in by means of folding gates



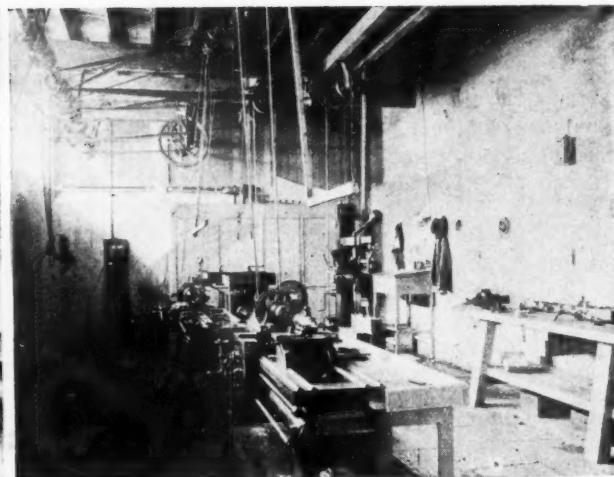
Above—Showing separate compartments for storage of automobiles in Pancorvo garage in Lima, Peru. Note overhead method of lighting



Left — Cutting room of Pancorvo Bros. & Co. garage in Lima, Peru, showing up-to-date methods of progressive South American company



Heat and welding department of Pancorvo garage



Drilling room of the Pancorvo Bros. garage

of which are Renault limousines, of low horsepower, but giving excellent service and of smart appearance. A number of Fords and Hudsons are in evidence. Case cars have recently appeared, and an opening exhibition of Marmon cars, the first imported into Peru, has just been given. There are a few other cars of foreign make, none of them, however, less than perhaps 3 years of age.

Comparatively few motor trucks, only about fifteen, have as yet traversed Lima's streets. Grace & Co. use two 5-ton trucks. Two are used on the Cerro de Pasco Railway, between Talarrioc and Tarma, for carrying passengers. Rocca & Miller, a large importing house of Callao, uses a Chalmers truck. At least one is employed by the Peruvian army. Some of the light-weight variety are used in Lima for transporting passengers. Their wider use is made difficult because of the condition of the city's pavements, which are not strong enough to withstand the wear and tear of such vehicles. It seems that a more extended and vigorous campaign for better street paving will have to be carried out before general motor truck traffic will be in evidence. The Alcalde of Lima in his last annual report discussed at length the need for street paving in Lima and it is probable that an extensive street paving project for the city will be developed.

The last session of the National Congress passed the Road Law, which makes it possible for the National Government of Peru to co-operate with the departmental and municipal governments in assisting property holders to improve the country highways of Peru. Since the passage of this law, the public press of Lima has devoted a great deal of intelligent effort to a campaign for the improvement of old roads and construction of new highways throughout the country.

As a result, several new roads have been already opened, notably that connecting the city of Tarma with the railway at Talarrioc. Several other projects are under investigation by the Highway Division of the Department of Fomento. Property holders along the public highways are co-operating with considerable enthusiasm with the Department of Fomento. The entire movement is gaining headway with increased enthusiasm for motoring and more numerous sales of cars.

Peru has a population variously estimated at from 2,500,000 to 3,000,000. Though the country has been subjected to many wars and controversies over its boundary lines, much progress has been made by its inhabitants. There are about 676,638 sq. miles of land, of which the strip along the Pacific Coast has been rendered fertile by irrigation. Agriculture is the chief source of wealth despite the seeming incompatibility with the arid character of the country and the peculiar condition of its civilization. Sugar is the most important product, with cotton next. The successful development of coffee has been hindered on account of the difficulty of transportation. Much has been done with mining and one of the most important branches of Lima's industrial activities is the smelting works.

Lima, the most important city in Peru, has a population of about 200,000. This city stands on an arid plain. The older part of the city is laid out and built with mathematical regularity, the streets crossing each other at right angles. A broad boulevard of modern construction partly encircles the city, which has several roads of this type. There is a 3-mile road leading from Lima to Magdalena which is frequented by automobile owners.

Air Travel's Peace Prospects

THE prospects of aerial transport schemes after the war were discussed by Col. Mervyn O'Gorman in the fifth Wilbur Wright memorial lecture recently given before the Aeronautical Society. He directed attention to a number of points which must be carefully considered in connection with such schemes. Peace requirements of the British Army and Navy and orders that might be received from abroad would not suffice to keep a large aircraft industry going. Neither would this class of work produce the large reserve of pilots, mechanics, and other skilled workers that should be held in readiness for employment immediately on the outbreak of war.

From a commercial viewpoint, the greatest claim of the airplane to consideration is based almost entirely on the high speed obtainable in comparison with existing methods of transport, which advantage will more than compensate for its increased cost. It is obvious that the greatest amount of time-saving will be effected in long-distance journeys over seas, since marine transport is slower than land transport, and also because the inevitable loss of time at terminals is of less relative importance in long journeys than in short ones; foresight in the preparation of working schemes should, however, reduce this loss to the minimum possible in all cases. Financial arrangements, selection of routes, purchase of land, housing arrangements for personnel, compilation of lists of pilots, etc., preparation of designs for new machines, modification of existing machines, and the arrangement of motor services from cities to starting-points, are all matters to which careful attention should be given now if aerial transport services are to be inaugurated at the termination of the war.

It is generally admitted that some form of State aid will be required, at least at first, and Holt Thomas has suggested the subvention of mail and passenger services. There are, however, other ways in which the State may be called upon to assist private enterprise. One of these is the granting of limited interstate monopolies, which will be necessary to avoid destructive competition until the schemes are well established. The State might also bear part of the cost of maintaining landing grounds, especially if accommodation for service pilots were always available.

It is evident that if aerial transit is to be developed to any useful extent the question of flying over and landing in foreign countries will have to be considered at its inception. It would be of advantage to Great Britain if foreign countries were equipped with lines of landing grounds and aerodromes where necessary, and for this purpose it will be necessary to create abroad a body of opinion favorable to aerial transport. One way of effecting this would be to establish industrial links between aircraft constructors in the different countries. These matters might also be fostered by entering into relations with foreign societies devoted to aeronautics on both the technical and commercial sides. If landing rights are acquired in foreign countries they must be granted to foreign aircraft and the best plan would be to levy the smallest possible landing tax, provided that a reasonable degree of reciprocity is secured.

Smuggling by Aircraft

The matter of smuggling is a difficult question in connection with international flying. There seems to be nothing to prevent packages of dutiable goods from being dropped at night at prearranged points from aeroplanes which need not alight. It would be undesirable to insist on all incoming aircraft passing through some agreed port of entry for the purpose of customs inspection. Such a condition would diminish speed—one of the most important desiderata of aerial transport—and might also prevent pilots from taking full advantage of favorable winds. Colonel O'Gorman's remedy for this difficulty is to admit all air-borne goods free of duty, and to regard any advantage that might be derived from this arrangement by the aerial transport companies as a form of subsidy.

The plan certainly has the merit of extreme simplicity, and might perhaps be tried at first, as far as this country is concerned, where the number of dutiable articles is not large and the duty charged is generally less than in other countries; here the cost of collecting the duty might easily exceed the amount collected. Smuggling would only be profitable in the case of light and valuable goods on which a high rate of duty is charged, as in other cases the extra cost of transport by aeroplane would exceed the duty charged.

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Women in Industry

THE leading article in this issue calls attention to the way in which woman's part in industry is increasing and speculates a little on probable future developments. It is impossible to do more at the present time. There is just one clear fact that can be assured, and this is that women will play a more important part in the future of industry than they have done in the past.

In making comparisons between America and European countries at this juncture, there is another fact which must not be forgotten, and this is that a great number of the European women workers are not engaged in industry because they have to be or because they like it. It is a patriotic duty for women in Europe now, to work all their physique permits in war industries. For a girl to be doing some sort of inelegant and uncomfortable work in a munition plant is an honor, whereas in peace time it would be unthinkable for that same girl to become a "factory hand."

Just how great the number of women who are working wholly for the war and not at all from the viewpoint of the wage obtained it is impossible to judge; still more it is impossible to estimate just how many women in Europe are taking the factory way of earning their living, instead of the more

restful way they would prefer, on account of patriotic necessity. It is, however, certain that thousands of women in European factories will give up their work at the end of the war, and will retire forever from the labor market. For this reason curves of increase are not truly indicative of what the future will bring forth.

Change in Outlook

There is another side to the matter, and this is that many thousands of women in Europe who have avoided factory work because they thought it beneath their dignity, and have struggled along in unorganized and poorly paid clerical and other work, will stick to industrial occupation once they and their old associates have started it. The effect of all classes of the female population having gone to the workbench must be to raise the public estimation of the importance of that kind of employment.

There is another thing. Working in the old-style European factory—and there is really no need to specify European—was not as pleasant for a woman as work in a store or in an office. The world is discovering that men do much better work when their surroundings are comfortable, and women are far more susceptible to surroundings than men. The efficiency of female labor is increased beyond belief by that class of activity usually specified by the odious term of "welfare" work on the part of the employer.

In the very old days employers cared for the well-being of their employees in every way. The apprentices and the favored hands were often almost members of the manufacturer's family. This system broke down naturally with growth in the size of businesses and with the exchange of the company for the individual employer. Probably factory work was never so unpleasant as it was some thirty or forty years ago, and the gulf between employer and employee never so great. It seems that to-day, the family plan of running a big plant being impossible, we are turning to the co-operative club plan; although it is hard to find a phrase that expresses it.

Fighting Migration

There is another item too. In the old days men stayed with a business for life more often than not. Lately men rarely stay long in any one plant; in fact the migratory tendency of labor is one of the great problems of business of to-day. It is believed that a change for the better can be induced by creating a patriotism for the industrial establishment akin to the patriotism for home town or for country. The question is just how to do it.

The answer seems to be that just as the plant and machinery owned by the employer are necessary adjuncts for the man, to enable him to earn his living, so is some organization necessary to enable him to enjoy his life outside working hours. If this be true of men it is far more true of women. A woman can rarely stand alone in the world in the way that a man can, partly owing to long centuries of habit, more still because of essential physical difference manifested by the fact that women

in a normal, healthy state suffer far more than men from trifling ailments. In the present stage of civilization, whatever may happen in centuries to come, it seems that women cannot happily live their lives quite individually.

The extent to which female labor will be used in the automotive and in most other industries depends upon the success encountered in trying to discover the best ways to make factory life enjoyable. Manufacturers' experiments in this direction are as yet in their infancy, and they are almost always individual. There seems good reason to think that co-operation between one factory and another would be helpful, that a great responsibility rests upon municipalities in industrial districts, that state and nation must bear their share in turn.

Road Building in War Time

IN recent years, road building in the United States has been carried on on an enormous scale. Millions of dollars have been spent annually, particularly in some of the Eastern States, for highways with a solid foundation and a macadam or tarmacadam surface. With the growing scarcity of labor, however, there has come a noticeable slowing down in road activities in many sections, and an impression has gained ground that road work would almost entirely cease for the period of the war. Those who held this view were no doubt greatly surprised by the resolution of the Chamber of Commerce of the United States, in convention at Atlantic City last week, recommending that the improvement of our highways be carried forward in every proper way.

It appears that at the present time our agricultural and industrial development is hampered by limitations of our transport facilities. The railroads are congested everywhere, and manufacturers are hard put to it getting raw materials and delivering their products. Transportation by water helps, but is confined within narrow limits. The increased demand for transport facilities is, of course, due largely to military activities. In order to provide the transport facilities needed for the requirements of the Army and the Navy those employed for other purposes must be curtailed as much as possible. Above all, the question must be studied of how to get the products of the factory and the farm to the consumer with the least waste of effort. Where there is a system of good highways the motor truck will render splendid service in this connection. For instance, much of the freight traffic between the manufacturing towns of New Jersey, on the one hand, and the cities of New York and Philadelphia on the other, can be carried on with motor trucks. Similarly, farm products can be carried to market in the cities by motor truck if the roads are in good condition. The ton-miles or car-miles of which the railroads are relieved in this manner do not nearly measure the amount of relief really given them, because where short hauls are involved the time lost in loading and unloading cars, and the consequent congestion in freight yards, counts for much.

Therefore, in order that our transportation facilities may be brought to the highest state of efficiency, road improvement should be continued during the crisis through which we are passing. Our present system of improved roads should be well kept up, and where gaps exist that interfere with important transport schemes connecting links of roads should be constructed.

"Grain Alcohol" from Wood

RECENT advances in chemical technology necessitate a revision of the present terminology relating to the alcohols. It is customary to distinguish between grain alcohol and wood alcohol, according to the derivation of the product. However, it has now been found possible to produce from wood an alcohol identical in its chemical composition with the alcohol ordinarily obtained from grain. This makes it plain that the old terminology will no longer serve, and that we will have to fall back on the chemical terms ethyl (for grain) alcohol and methyl (for wood) alcohol.

There are important differences between the two alcohols both as to physical properties and chemical composition. On the spur of the moment one might say that methyl alcohol is a poison while ethyl alcohol is not, but this statement would hardly be allowed to pass without challenge. A safer statement would probably be that ethyl alcohol does not possess the same toxic qualities as methyl alcohol. There are also important differences in the processes of manufacture of the two alcohols. Ethyl alcohol always is the product of the fermentation of sugar, and when it is produced from wood the latter is first transformed into sawdust, which is treated with certain acids to produce chemical sugars. These are later submitted to fermentation and distillation processes. Methyl alcohol, on the other hand, is a product of wood distillation. The wood is heated in retorts, and the vapors given off are condensed, yielding methyl alcohol among other products.

Methyl alcohol is widely used in the industries in spite of its injurious effects upon the health of operatives. Many people have been blinded by its fumes, and special inquiries have been made as to how its dangers could be reduced.

The alcohol which has been repeatedly proposed for use in internal-combustion engines is ethyl alcohol, and if it can be successfully produced from wood it is not impossible that its price may come down where it can compete with gasoline as a motor fuel. As alcohol has only about 60 per cent of the heat value as gasoline, volume for volume, the price of the alcohol per gallon must be considerably lower than that of gasoline before it can compete.

The problem of ethyl alcohol production from wood has been investigated by the National Forest Service and a report on it has been issued by the Department of Agriculture. It has been found, for instance, that the amount of impurities in ethyl alcohol is no greater when it is produced from wood than when it is produced from grain, and the impurities in the former case are less harmful.

News of the Automotive Industries

Ford Assets Total \$158,834,779

**\$400,000,000 Business—785,432
Cars Produced—900,000
for 1918**

DETROIT, Sept. 25—The Ford Motor Co. in its annual report for the fiscal year ended July 31, 1917, shows an increase of \$26,754,560 in total assets and a reduction of \$7,420,381 in the amount of cash on hand and in banks, as compared with the same period for 1916. The company also displays a large increase in the valuation of inventory of goods and merchandise.

Assets displayed in the report show:	
Real estate used in company's business	\$27,292,542.80
Real estate not used in company's business	None
Goods, chattels, merchandise and other tangible properties	66,921,158.13
Cash on hand including deposits in banks	45,130,390.96
Patent rights, copyrights, trade marks and formulas	No value
Good-will	Nothing
Credits owing to the company	19,490,657.10
All other property	Nothing
Total	\$158,834,778.99
Liabilities shown in the statement include:	
Liabilities on real estate mortgage	Nothing
Liabilities on chattel mortgage	Nothing
Liabilities on all other secured indebtedness	Nothing
Liabilities on all unsecured indebtedness	\$25,229,871.74
Total	\$25,229,871.74

Total business transacted for the year is between \$350,000,000 and \$400,000,000 as compared with a gross business of \$206,867,347 for the fiscal year ended July 31, 1916. The company produced 785,432 cars as against 533,921 cars for the preceding year. The schedule for 1918 calls for 900,000 cars and the company is now producing 2700 cars per day and anticipates a production of 3000 cars per day by Oct. 1. Workers numbering 37,000 are employed as compared with 27,002 a year ago. The largest day's output for the past fiscal year was 3310 cars. Production schedules for the past 13 years are as follows:

Year	Cars Made and Sold	Increase or Decrease	Daily Average
1917	785,432	plus 251,511	2618
1916	533,921	plus 255,708	1816
1915	308,213	plus 59,906	1027
1914	248,307	plus 83,855	827
1913	164,452	plus 95,908	545
1912	68,544	plus 30,078	228
1911	34,466	plus 15,802	115
1910	18,664	plus 8,057	62
1909	10,607	plus 3,209	35
1908	6,398	minus 2,025	21
1907	8,423	plus 6,284	28
1906	1,598	minus 96	5
1905	1,695	minus 13	5
1903-4	1,708		

The stupendous growth of the Ford Motor Co. is displayed by comparison of

sales for 1917, amounting to more than \$350,000,000, with the sales of 1903-4, which were less than \$2,500,000.

The Ford company will undoubtedly have sales running far past the aggregate of the 1917 sales for 1918 because of the many branches of operation the company now follows. It is manufacturing hundreds of thousands of airplane cylinders for the Government, ambulances and trucks for the Government and Red Cross and trucks for private sales in addition to its tremendous schedule for passenger cars. The company has started work on its River Rouge foundry.

The past year has been an eventful one for the Ford company, with the Ford-Dodge suit probably constituting the most important single happening. This suit has not yet been settled but it appears now as though the Ford company will not receive an adverse decision on its River Rouge activities since the War Department has given its sanction to the enterprise. The blast furnaces at River Rouge which will furnish all of the iron and steel for Ford cars has been approved for construction by the Court following the deposit of a \$10,000,000 bond by Henry Ford, and excavation, as was recently announced in AUTOMOTIVE INDUSTRIES, has started, and the plant which will cost \$20,000,000 is now under way. Other recent activities of the Ford Motor Co. include: Completion of \$500,000 worth of ambulances, beginning of production of Ford trucks, reception of a government contract for 40,000 of these trucks for war purposes.

The Ford company has also changed its dealer policies and in place of making the usual one-year contract, as has always been done in the past, it is now making contracts with agencies which stipulate the yearly allotments but which may be terminated at any time.

Bragg Creates New Altitude Mark of 21,800 Ft.

NEW YORK, Sept. 21—Caleb Bragg, prominent in years gone by, has entered the United States Army aviation field at Hempstead Plains, Long Island, and has distinguished himself by breaking the American airplane record for altitude. He flew 21,800 ft. by rough register, and believes his recording instruments will prove he ascended 22,000 ft. Bragg's barograph showed an altitude of 22,000 ft. in a flight last Monday. The world's professional record is held by H. G. Hawker, who ascended 24,408 ft. at Brooklands, England, April 23, 1916.

Bragg's feat required 1½ hr. to make the ascent, and he came down in long spirals in just 30 min. His machine was a Wright-Martin biplane, with a 160 hp. engine.

U. S. Mail by Air After War

Airplane Routes To Be Established—All War Vehicles and Planes To Be Used

WASHINGTON, Sept. 24—The motorization of the postal service of the United States, towards which important steps have already been taken, is to be widely extended with the close of the present war and, possibly, to a considerable extent, before that time as a result of an amendment to Senate bill authorizing experiments in motor truck delivery by the Postoffice Department. This amendment, adopted following conferences between the Postmaster General and the Secretary of War, and which has been approved by the President, provides that the Secretary of War may turn over to the Postoffice Department all military airplanes and motor vehicles not serviceable for military purposes, or which after the war may be dispensed with for military purposes.

The amendment reads:

"Provided, That the Secretary of War may, in his discretion, deliver and turn over to the Postmaster General from time to time, and without charge therefor, for the use in the postal service, such airplanes and automobiles, or parts thereof, as may prove to be, or as shall become, unsuitable for the purposes of the War Department; and the Postmaster General is hereby authorized to use the same, in his discretion, in the transportation of the mails and to pay the necessary expenses thereof out of the appropriation for inland transportation by steamboat or other power-boat or by airplanes from the appropriation for inland transportation by Star Routes."

Both Italy and France are now making use of airplanes no longer suitable for military use for the delivery of the mails. Italy has an aerial mail route from her coast to Sardinia, and is able to deliver 500 lbs. of mail within 2 hours. France has a similar aerial mail route between her coast and Corsica.

The plan of the Postoffice Department is to use such motor trucks as it may get under the above authorization for the extension of the parcel post service. This amendment was added to the bill under which \$300,000 is appropriated for use by the Postmaster General.

Buick Builds \$500,000 Addition

FLINT, MICH., Sept. 21—The Buick motor division of the General Motors Co. is building a new warehouse and loading dock at a cost of \$500,000, which will greatly facilitate shipments. The company is also erecting a new office building, which will be completed within the next ninety days.

Motor Tax Fight Goes On

To Determine Whether Car Is Luxury or Not—Makers Represented at Capitol

WASHINGTON, Sept. 24—Whether the automobile industry will be classed with fiddles and talking machines, as well as face powders and other articles that might be similarly classed, will not be determined for a few days yet. The Conference Committee which has the war tax matter in hand is still debating on placing a manufacturers' tax on these. The automobile, it appears, may have a 3 per cent tax levied on the wholesale price as sold by the manufacturer to the dealer or distributor. Chairman Claude Kitchin of the Ways and Means Committee of the House is determined that the automobile must pay this tax. He is making a tremendous fight and trying to dominate not only his own committee, but the Conference Committee of the House and Senate. Up to this time there has been a good division in the Conference Committee.

The route of the 3 per cent tax, which Chairman Kitchin seems determined to enforce, apparently rests with his conviction that the automobile is a luxury, and one would apparently not be wrong in inferring that Chairman Kitchin would not be disappointed, in fact pleased, if the entire manufacture of automobiles was stopped. He apparently considers the automobile solely as a luxury, and he seems to be entirely honest with himself in this view.

Fortunately the automobile industry scattered all over the country is waging a great campaign of education with members of the Senate, members of the House and the three committees that have the matter in hand, namely, the Ways and Means Committee of the House, the Finance Committee of the Senate, and the Conference Committee which is made up of members from the House and Senate. The personnel of all is published herewith.

It is the injustice of the tax that has roused such indignation on the part of automobile manufacturers, dealers and owners. There is no reason why the automobile should be singled out and taxed when the pleasure motor boat is not. The horse carriage is not taxed. The bicycle is not taxed. The passenger steamboat is not taxed. For some unknown reason the automobile has been singled out and classed with talking machines, cosmetics, etc., which are to be similarly taxed.

It is unfortunate that such men as Chairman Kitchin cannot see that the automobile is more to-day than a luxury. It is impossible to understand how he can be so ignorant of the rôle played by the automobile to-day. It is granted that percentage of the use of the automobile is a luxury, but when it is remembered that nearly 70 per cent of the machines

are owned by farmers, and that these farmers are using them as utility machines, the luxury argument disappears. Fortunately many Senators and Congressmen know of the utility use of the automobile, not only with farmers, but with hundreds of thousands of business people. This is attested to by the fact that one Congressman admitted having received over 600 telegrams from automobile people in his district protesting against the unfairness and the discrimination of the tax.

It has been suggested by the Conference Committee, and Mr. Kitchin has shared in the suggestion, that the automobile manufacturers pass this tax on to the ultimate buyer of the car. The scheme would apparently work out as follows: The manufacturer would bill the dealer or distributor at the regular price and add 3 per cent war tax in addition. The dealer would then have to pass this on to the buyer or take it out of his trade discount. It seems that the dealer is the goat. He will either have to pay it himself or increase the price of the car to his buyers. The manufacturer, however, is made responsible for the collection of the tax, as he will have to pay the Government.

Something definite as to final action on the report will be expected in a day or so. If the Conference Committee brings in a unanimous report favoring the 3 per cent tax, it is certain to become a law. It is more than possible that there will be a division in the report, which means the matter will be referred back to the Senate and probably to the House.

For convenience the names of the last three committees are given herewith.

Ways and Means Committee, House Office Building, Washington, D. C.

Claude Kitchin	North Carolina
Henry T. Rainey	Illinois
Lincoln Dixon	Indiana
Cordell Hull	Tennessee
John N. Garner	Texas
James W. Collier	Mississippi
Clement C. Dickinson	Missouri
William A. Oldfield	Arkansas
Charles R. Crisp	Georgia
Guy T. Helvering	Kansas
Joseph W. Fordney	Michigan
J. Hampton Moore	Pennsylvania
William R. Green	Iowa
Charles H. Sloan	Nebraska
Ebenezer J. Hill	Connecticut
Nicholas Longworth	Ohio
Geo. W. Fairchild	New York
John A. Sterling	Illinois
Whitmell P. Martin	Louisiana

Conference Committee, Capitol Building, Washington, D. C.

Senate

F. M. Simmons	North Carolina
Wm. J. Stone	Missouri
John Sharp Williams	Mississippi
Boies Penrose	Pennsylvania
Henry Cabot Lodge	Massachusetts

House

Claude Kitchin	North Carolina
Lincoln Dixon	Indiana
Henry T. Rainey	Illinois
J. Hampton Moore	Pennsylvania
Joseph W. Fordney	Michigan

Finance Committee of the Senate

F. M. Simmons	North Carolina
William J. Stone	Missouri
John Sharp Williams	Mississippi
Boies Penrose	Pennsylvania
Henry Cabot Lodge	Massachusetts

House

F. M. Simmons	North Carolina
William J. Stone	Missouri
John Sharp Williams	Mississippi
Hoke Smith	Georgia
Chas. S. Thomas	Colorado

Senate

Ollie M. James	Kentucky
William Hughes	New Jersey
Thomas P. Gore	Oklahoma
Andrieus A. Jones	New Mexico
Peter G. Gerry	Rhode Island

House

Boies Penrose	Pennsylvania
Henry Cabot Lodge	Massachusetts
Porter J. McCumber	North Dakota
Reed Smoot	Utah
Jacob H. Gallinger	New Hampshire

Senate

Robert M. LaFollette	Wisconsin
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Standard Parts Gets Rim License

Litigation With Universal Rim Terminated By Taking Baker Rim License

CHICAGO, Sept. 25—The long standing litigation between the Universal Rim Co. and the Standard Parts Co. of Cleveland has been terminated by an adjustment, through which the Standard Parts becomes free to manufacture rims of every type embodying features covered by the so-called Baker groups of rim patents.

The Standard Parts Co. is advising the trade that it is now the only manufacturer in the field unfettered by any patent litigation. This being true, the company is in a position where its rim and tube division, formerly the Standard Welding Co., once more can claim the position it previously held without dispute.

The exact status of the Standard with respect to Baker has been in doubt for some time, during which there was a long period of actual litigation. The Universal Rim Co. brought suit against the Standard Welding Co., but the issue was settled out of court and a license taken. When the Standard Welding Co. was merged in the Standard Parts Co., however, the license was not transferred, and the situation was made more complicated by a supposed nearness of interest between the standard organization and the Perlman Rim Corporation, with which Baker is in litigation.

A rumor was afloat in Detroit this week to the effect that the Standard Parts Co. denied that a settlement had been made between it and the Universal Rim Co., but that it probably would be. A statement by Erle K. Baker, president of the Universal Rim Co., to-day put this rumor at rest. Mr. Baker declares that the settlement has been made and that the Standard Parts is now free to make rims under license direct from the Universal Rim Co.

Chalmers District Managers Retained by Maxwell

DETROIT, Sept. 21—The district managers of the Chalmers Motor Co. have been retained by the Maxwell Motor Co. Thomas J. Toner, sales manager of the Maxwell company, addressed each of the Chalmers district managers at a convention, talking separately to each, and then making a collective address outlining future policies.

Maxwell Motor Co. agencies will not take over Chalmers agencies, nor will Chalmers agencies take over Maxwell agencies, according to an announcement made by the Chalmers Motor Co. in answer to an erroneous report which gained circulation last week. The Maxwell company states that it is not its intention to make alterations in the arrangements with agencies and distributors.

Small Car Makers Having Difficulties

Higher-Priced Car Sales Decreasing—Big Producers Have Excellent Business

DETROIT, Sept. 24—Several of the smaller manufacturers of assembled cars selling at popular prices are experiencing difficulties. As with the higher-priced cars, sales have decreased despite the puzzling fact that large manufacturers of low-priced cars are enjoying record-breaking business. In addition, many manufacturing problems have arisen. Some makers of parts are turning to war orders. Others are unable to secure materials. And still others are withholding parts from the smaller car companies because of lack of faith in their financial credit and because of current predictions to the effect that the smaller manufacturers will be unable to weather the materials, labor and other war conditions now existing and promising to become even more perplexing in the near future.

Manufacturers of higher-priced cars continue their reports of declining sales and one large concern which for August reported a 20 per cent increase in its product, which sells for more than \$3,000, now states that sales have fallen to a marked extent within the past 2 weeks.

The larger companies manufacturing popular-priced cars are still finding business better than last year. Buick Motor Co., which is turning out 544 cars daily, this month plans a schedule of 625 cars per day in October. The Saxon Motor Car Corp. which a few months past was experiencing sales difficulties, now reports large business and states that last week witnessed the highest sales marks since the spring drive.

The Ford Motor Co., Willys-Overland Co., Maxwell Motor Co., Dodge Bros., Paige Motor Co., Oakland Motor Co., Reo Motor Co., Chevrolet Motor Co., Dort Motor Co., United Motor Co., United States Motor Co., and Republic Truck Co. all report excellent business.

Lansing companies including Reo and Olds are already beginning to experience freight difficulties and are making plans for overland drive-aways for the coming winter, and urge their dealers to start the drive-aways before the very heavy cold weather sets in. The Reo company is producing 100 cars per day and both Reo and Olds are operating at full production capacity.

GENERAL MOTORS HAS \$15,500,000 IN BANKS

NEW YORK, Sept. 24—The General Motors Corp. has more than \$15,500,000 cash in the bank, plus \$1,000,000 of Liberty bonds, and nearly \$5,000,000 of sight drafts in connection with cars in process of delivery, according to W. C. Durant, in a statement to the press last week. The corporation has not sold any cars

except for spot cash. Mr. Durant stated that no financing was contemplated, and that no merger with any other companies was at present contemplated.

In the fiscal year, beginning Aug. 1 and running up to Sept. 15, there have been sold 2349 Cadillacs against 452 in the same period last year, 3740 Oldsmobiles against 1074 last year, 16,039 Buicks against 12,120 last year, and 829 trucks against 316 in the same period of the last fiscal year. The company has 588 trucks finished and awaiting delivery to the Government.

All cars and trucks of every description sold from Aug. 1 to Sept. 15 amounted to 27,071 against 16,963 in the same period last year.

Colt Made Overland New York Manager

NEW YORK, Sept. 27—*Special*—William L. Colt, president of the Colt-Stratton Co., Metropolitan distributor of Dodge Brothers cars, will on Nov. 1 become manager of the New York branch of the Willys-Overland Co.

Colt will retain his interest in the Colt-Stratton Co. but will relinquish active participation in its management.

The Colt-Stratton Co. was formed in 1909 to distribute the Cole car, Colt becoming president and H. L. Stratton vice-president. Immediately the Dodge Brothers car was placed on the market, the Colt-Stratton Co. became a distributor. Both cars have been handled continuously since then but the Cole is to be dropped Oct. 1.

The Willys-Overland Co. moved into its new building at the corner of Broadway and Fifty-fifth Street about a year ago and controls branches in Newark, N. J., Brooklyn, Yonkers and the Bronx. W. D. Stewart has been acting as temporary manager and will return to the factory shortly after the inauguration of Colt.

Aircraft Board Reorganized

WASHINGTON, Sept. 27—The Senate adopted to-day, without a dissenting vote, the Sheppard-Hulbert bill as amended by the House. This provides for an Aviation Aircraft Production Board of nine members and carries an appropriation of \$694,000,000. The personnel of the board will include three naval and three army experts and three civilians, all to be appointed by the President. The chairman will be a civilian member and it is reported that Howard E. Coffin will hold this position. It is expected that F. A. Deeds will remain on the board, though the status of Sidney D. Waldon is not certain. It is expected that the bill will be signed by the President to-day.

12,917 Republic Trucks Sold

NEW YORK, Sept. 24—The Republic Motor Truck Co. in the year ended June 30 last sold 12,917 trucks, an increase from 219 trucks in 1914, from 1004 in 1915 and 3851 in 1916.

Hudson Men Form New Company

Essex Co., Entirely Separate, To Bring Out New Model at Lower Price Than Hudson

DETROIT, Sept. 26—*Special*—Members of the Hudson Motor Car Co. organization are forming a new company for the manufacture of automobiles, to be known as the Essex Motor Car Co. It will have a paid-in capital of \$500,000 and will bring out a new model which members of the company think is demanded by the new conditions in the automobile market.

The new car will not conflict with the Hudson models and the new company will have no direct connection with the Hudson company. The officers of the new company are as follows: W. J. McAneny, factory superintendent of the Hudson company, president; R. B. Jackson, secretary and treasurer of the Hudson company, vice-president; A. Barit, purchasing agent of the Hudson company, treasurer; and J. L. Vette, secretary. In addition to the above the Board of Directors will include: Roy D. Chapin, O. H. McCormack and F. O. Bezner, who are president, sales manager and vice-president of the Hudson Motor Car Co., respectively. The specifications of the new car will be announced at a later date. It is reported, however, that it will sell at a price considerably lower than the Hudson. Separate factories are being looked for and an announcement in this connection may be expected in the near future.

Maxwell Loses To Ward Leonard

NEW YORK, Sept. 26—The Maxwell Motor Sales Co. will have to pay about \$35,000 a month damages to H. Ward Leonard, Inc., according to a decision of Judge Hough in the United States District Court, who has declined to modify a previous decree enjoining the Maxwell company from further infringement of its patents, Nos. 1,157,011 and 1,122,774 granted to Harry Ward Leonard and covering a lighting system. The first patent was dated Oct. 19, 1915, and the second Dec. 29, 1914. The Court on Sept. 17 entered an order suspending the injunction and accounting upon condition that the Maxwell company file a bond for \$5,000 and file monthly statements of all cars and apparatus embodying the inventions of the patents shipped or delivered by it subsequent to the decree and until the issuance of the mandate of the Circuit Court of Appeals, and in the event of the affirmation of the decree to pay to the Ward Leonard interests \$5 for each apparatus shipped during the period of suspension. The Maxwell company then moved the Court to modify the order by relieving it from the requirement to pay \$5 for each apparatus.

According to an affidavit, the Maxwell company is handling at least 7000

cars per month, and that at least two months would be required before another system could be safely put in production.

Gasoline Prices To Be Reduced

WASHINGTON, Sept. 26—Fuel oil and gasoline prices are the next on the list of the Government for a general reduction. Cost production estimates have been turned over to President Wilson, the estimates showing that it now costs 14 to 20 cents a gal. to produce gasoline and from 90 cents to \$2 to produce fuel oil. Under the food bill, under which it is expected the bill will be moved, the Government is given the same control over fuel as it is now given over foodstuffs.

Thompson Heads Martin Airplane Co.

DETROIT, Sept. 26—The Glenn L. Martin Airplane Co., Cleveland, at a stockholder's meeting yesterday, elected the following officers and directors: president, C. E. Thompson; vice-president and general manager, Glenn L. Martin; treasurer, S. L. Mather; secretary, C. M. Osborne. Directors include W. D. Mather, C. E. Thompson, Glenn L. Martin, S. L. Mather, C. M. Osborne, Charles W. Bingham, M. C. Johnson, Alva Bradley and W. C. Turner. President Thompson is also president of the Steel Products Co., but his new position will not necessitate his resignation from the steel company.

Emerson Motors Reorganized

KINGSTON, N. Y., Sept. 26—The Emerson Motors Co. has been reorganized as the Campbell Motor Car Co. and will produce a new car which is to sell for \$750. T. A. Campbell will be president and general manager of the company, other officers not yet having been elected. The capitalization of the new company will be slightly less than \$2,750,000 and it is said that more than 70 per cent of the old stockholders have agreed to accept one-third share of stock in the new company for one share of the old. All of the promotion stock issued by the old company is to be called in and charged off. It is stated that present assets total about \$600,000.

At present the company is operating its Kingston plant and turning out about 18 cars a week. There is about two-thirds of the parts on hand to build 250 cars, all parts being standard and bought in the open market. The same motor will be used and this will be built in Waltham, Mass., for the time being. Other component parts include a Salisbury axle and Muncie gearset. It is stated that the dealer organization built up by the Emerson company will be retained practically intact the list including about 225 dealers.

Olympian Motor to Make Bodies

DETROIT, Sept. 26—The Olympian Motor Co., Pontiac, has bought out the Meridian Mfg. Co., Indianapolis, which makes bodies and will move everything to Pontiac and manufacture its own bodies at output of twenty per day.

Chevrolet Wins at Sheephead

Also Breaks 100 Mile Record— De Palma Wins Handicap— Resta Fails to Finish

HARKNESS GOLD TROPHY RACE

Driver and Car	Time	M.p.h.
Chevrolet, Frontenac.....	54:20.98	110.4
DePalma, Packard.....	56:18.40	106.5
Hearne, Duesenberg.....	56:41.15	105.8
Mulford, Frontenac.....	56:41.50	105.8
Vail, Hudson.....	56:41.87	105.7
Hickey, Hudson.....	60:39.70	98.8
Lewis, Hoskins.....	60:48.30	98.7
Henning, Mercer.....	60:48.85	98.7
Milton, Duesenberg.....	60:55.20	98.5
Benedict, Benedict.....	61:42.80	97.3
Boyer, Frontenac.....	.....	.....

FUTURITY HANDICAP—10 MILES

Heat	Driver and Car	Time	M.p.h.
1....	LeCain, Delage.....	6:07.6	97.8
2....	DePalma, Packard...	6:20.4	95.7
3....	Boyer, Frontenac....	6:07.51	97.9
Final...	DePalma, Packard...	6:11.6	96.9

SHEEPSHEAD BAY SPEEDWAY, Sept. 22—The biggest crowd in the history of the Sheephead Bay Speedway saw Louis Chevrolet at the wheel of a Frontenac beat a field of 18 starters in the Harkness Gold Trophy race to-day, and set up a new record for 100 miles in doing so. Dario Resta in a Frontenac and Ralph De Palma in a Packard pressed him hard in the first part of the race, but a broken camshaft eliminated Resta at the end of 14 miles, and a stop for tires at 46 miles robbed De Palma of all chance of winning first place; he finished second, Chevrolet being more than two laps ahead of the rest of the field.

Although the speed was record-breaking and the drivers well-known, the major event did not call forth any such demonstration as greeted the drivers in the four 10-mile heats of the Futurity Handicap. In the first heat the scratch men could not catch the limit man, Le Cain in a Delage. But in the second and third heats, De Palma on scratch in the former and Boyer in a Frontenac in the latter, both caught the limit men in the stretch, and the yell of excitement that went up from the stands left no room for doubt as to the popularity of short handicap events.

Chevrolet's record beats his own time made on the Chicago speedway on Labor Day, when he beat Lewis in a Hoskins over the same route in 56:29.50. The new record is for cars in the 231-300 cu. in. class, and is 2:08.52 better than the other.

All the Frontenacs and De Palma's Packard used Bethlehem spark plugs, and all except Haibe used Goodyear tires.

5000 MEN FOR LINCOLN MOTOR

DETROIT, Sept. 21—The Lincoln Motor Co., organized by Henry M. Leland and W. C. Leland, as announced in a recent issue of THE AUTOMOBILE AND AUTOMOTIVE INDUSTRIES, will employ more than 5000 men at full production.

Work was started Saturday on the large factory which will be erected by the company. A 50-acre site has been purchased and approximately \$5,000,000 will be invested. The first excavations by steam shovel have been commenced, and it is expected that the plant will be producing the new Liberty airplane motors within 3 months. The business is being launched on a permanent basis and will undoubtedly be the biggest of its kind in this country.

FORD ACCESSORY SHOW A BUSINESS GETTER

CHICAGO, Sept. 22—After running for 2 days, the much-talked of Ford accessory show being held at the Coliseum here, gives promise of being a good business getter. The exposition opened last Saturday night and will run for a week. From an attendance viewpoint the big hall is relatively empty compared with the annual automobile show; in fact, it is questionable if there are ever more than 1500 visitors in the building. Naturally a large percentage of these have received complimentary tickets, as it was a part of the show policy to generously distribute free admission through the exhibitors.

There are approximately 100 exhibit spaces on the main floor of the Coliseum, these representing the products of over 150 different manufacturers. As the show was not sanctioned by the Motor and Accessory Association, which organization participates in the New York, Chicago and Boston shows, the members of the association are not present, although there are a few of them on hand and the products of other members are exhibited by jobbers and distributors.

It is not possible at this early date in the show to correctly gage its success as a business getter. Some exhibitors claimed that Monday was a very good business day, one exhibitor claiming to have sold over \$30,000 worth of merchandise to jobbers on that day. Most of the attendance gives indication of being a buying crowd rather than show visitors looking as their curiosity prompts them. The official attendance on Monday was given out at 6500, of which seven-eighths was complimentary and the remainder paid.

Chandler Makes Financial Statement

CLEVELAND, Sept. 22—The balance sheet of the Chandler Motor Car Co., as of Sept. 1, 1917, shows the following assets and liabilities:

Assets	
Cash	\$1,265,885
Liberty Bonds.....	278,576
Accounts receivable.....	284,138
Inventories	3,552,639
Plant	491,882
Other assets.....	95,182
Good Will.....	5,000,000
Total	\$10,968,302

Liabilities	
Capital stock.....	\$7,000,000
Accounts payable.....	1,102,071
Reserves	182,862
Surplus	2,683,369
Total	\$10,968,302

Industrial Review of the Week

A Summary of Major Developments in Other Fields

NEW YORK, Sept. 27—Radical moves have been made in the industrial world during the past week. The most striking change was the fixing of steel prices, the effect of which is discussed at length in other pages of this issue. The textile world has been aroused by the decision of the Egyptian government to restrict the cotton acreage for 1918 in order to have more land available for cereals. This measure also affects the rubber interests, as the Egyptian cotton is needed in the manufacture of tires. The fixing of the price of copper at 23½ cents a pound f. o. b. New York, was another important feature of the week. The bituminous coal situation is rapidly becoming critical. An encouraging move from the shippers' angle was the action of the United States Government in finally officially commandeering 2,000,000 tons of merchant shipping under construction in American yards for the account of foreign Governments.

Egypt Curtails Cotton Production

Another move which is likely to produce a shortage of cotton in the American market greater than that now experienced is the decision of the Egyptian Government to restrict the cotton acreage for 1918 in order to have more land available for cereals. The British Government regulations with regard to the exportation of this cotton to America had already cut off the supply from this country so that the domestic market is not directly affected; the reduction of the supply throughout the world, however, means that England will need more cotton from this country. The Lancashire mills which have depended on the Egyptian crop in years past will be hit especially hard, and will likely endeavor to get Sea Island cotton from America.—*Wall Street Journal*.

Engineering Colleges in War Work

The war has drawn heavily on the engineering colleges. An investigation of these institutions in the United States reveals that of the total of fifty-one, only seven expect to have 100 per cent attendance this year. Thirty expect 90 per cent enrollment; ten expect 80 per cent; nine, 75 per cent; four, 85 per cent; three, 60 per cent; and three, 70 per cent. The figures would be still lower were it not for the fact that the total freshman enrollment, made up in large part from men too young for military service will be the largest on record. There are many members of the various faculties absent on war duty. Military engineering, military geology, and military drill, have been established at some institutions.—*Electrical World*.

Bituminous Situation Critical

Government prices for bituminous coal have now been in effect for about a month and it has been a month of stag-

A New Service

Herewith THE AUTOMOBILE AND AUTOMOTIVE INDUSTRIES supplies for the benefit of its readers a general summary of important developments in other fields of business. This is rendered possible by the editorial co-operation of leading industrial publications which are recognized authorities.

By compressing the general industrial situation into this form we hope to give our readers a clear and comprehensive idea of up-to-the-minute developments which they could otherwise secure only with considerable expenditure of time and effort.

nation and uncertainty, if not actual chaos. Throughout this entire period from all parts of the country have come reports of a dearth of coal, of mines closing, of industrial plants curtailing output or ceasing operations entirely.

Two regions of the country appear to have been particularly hard hit by the price fixing order. These are the Northeast and the Northwest—New England, and the states north of California and west of the Rockies.

Various public institutions of Boston have advertised repeatedly for bids on their coal requirements without receiving a response. Some of these have been able to secure a scant day-to-day supply from private plants whose needs were well covered by contract. Similarly the State of Washington, one of the coal producers of the Pacific Northwest, has had to resort to purchasing stumpage and cutting firewood by convict labor in order to keep various state institutions going.

The fuel situation, because of low price fixation is rapidly becoming critical.

The production of anthracite coal is running perhaps higher than at any time in the history of the industry, and this fuel is moving to market rapidly. The demand for steam sizes is especially good. Shipments to the Great Lakes and to New England buyers would be uneasy were it not for the stocks of coal already accumulated in that section against the time of need. New England water power is especially good this fall, which is tending somewhat to relieve the demand for coal. Domestic grades in New York are in short supply and but few dealers will quote a time of delivery. The same is true to a less extent concerning most places throughout the East. The cold weather during the week has had a tendency to stimulate purchases of domestic sizes of anthracite. The steam grades of this fuel are in particularly strong demand since supplies of bituminous steam coals cannot be had except on contract and steam users are naturally turning to the small sizes of anthracite

wherever their furnaces are at all suitable for burning this fuel.—*Coal Age*.

Gasoline Exports Increase

WASHINGTON, Sept. 24—Exports of gasoline, naphtha, etc., for the 7 months ending with July, 1917, show a total of 241,986,595 gal., of the value of \$51,438,535, as compared with 198,147,553 gal. of the value of \$36,828,431, for the same period in 1916. Crude oil exported for this period was as follows: 1917, 96,279,393 gal., value \$4,433,610; 1916, 94,822,841 gal., value \$4,233,164. Other figures for these periods are: Lubricating oil: 1917, 156,306,919 gal., value \$29,391,389; 1916, 154,517,974 gal., value \$24,646,749. Residuum, fuel oil, etc.: 1917, 564,161,713 gal., value \$19,636,239; 1916, 517,688,684 gal., value \$14,208,754.

Receiver for Sun

ELKHART, IND., Sept. 22—The Sun Motor Car Co. has been placed in receivership by Judge J. L. Harmon. Emil Anderson has been made receiver. The complainant states that the total liabilities are \$33,000, and that the company was in danger of dissolving partnership and that it has been operated at a loss for the past 6 months, and that the assets will be more than the liabilities.

The company began operating about 18 months ago in the building formerly occupied by the Elkhart Motor Co., which went into receivership about 5 years ago. The members of the firm are: R. Crawford, general manager and president; L. R. Miser, secretary, and J. B. Black, of Chicago, treasurer.

Kelsey Wheels on Ford Tractors

DETROIT, Sept. 25—The Kelsey Wheel Co. has been awarded a contract for manufacturing the wheels for 7000 Ford tractors to be shipped to England. The order is a hurried one and the Kelsey works, already rushed with business, is making arrangements with the Detroit & Ecorse Foundry Co., Wyandotte, Mich., to handle the order. It is reported that the Kelsey company will erect a large building adjoining the Ecorse foundry and provide the patterns and equipment, and that the Ecorse foundry will furnish the raw material and do the work.

Emise Stops Active Work

CLEVELAND, Sept. 24—C. A. Emise, vice-president of the Chandler company, has resigned from active work with the concern and moved from Cleveland to New York. He will retain his official position with the Chandler company.

War Increases Copper Output 40%

Price Jumps from 14.9 Cents in 1914 to 27—Government Fixes Price

NEW YORK, Sept. 26—The output of copper has increased approximately 40 per cent since the start of the war in 1914, and the price has risen from 14.9 to 27 cents per lb. in the same time. With such a rapid increase in production and prices, the fixing of the price by the Government at 23½ cents a lb. should be a stabilizing influence. While the production increased approximately 40 per cent in the 3-year period, 1913-16, that of the United States increased about 60 per cent. That the war has had a potent effect on copper production is manifested in the figures showing production from 1914 on. World production since 1914 has been increased practically 1,000,000,000 lb., the biggest increase occurring in 1916, when 3,136,000,000 lbs. were produced as against 2,100,320,000 in 1914.

The United States leads in every respect in copper production, which is nearly ten times that of any other single country. The 1916 estimated production was 881,000 tons, out of a total of 1,397,000. It is not only the largest exporter of copper, but also the largest importer, due to the immensity of our smelting and refining facilities. Thus other countries are sending their copper to the United States to be smelted and refined. Our imports range above 100,000,000 lbs. per annum. As a result of this large importation the United States has large quantities for exportation, the total exports of pigs, ingots, and bars, in 1915 having been 677,000,000 lbs.; in 1916, 711,000,000 lbs., and in 1917, 1,022,000,000 lbs.

Prices have greatly advanced since the beginning of the war, owing to the demand for use in the manufacture of brass for shells, and other purposes. The average export price of copper passing out of the United States in form of pigs, bars and ingots was, in the fiscal year 1914, 14.9 cents per lb.; in 1916, 22.4 cents; January, 1917, 27.4 cents, and in June, 1917, 31.1 cents per lb., or materially in excess of the price now fixed by the Government for domestic use, or for export to the Allies, of 23.5 cents.

Gasoline Costs \$1.12 in London

LONDON, ENGLAND, Sept. 5—The price of gasoline keeps on increasing, the latest increase dating from Sept. 1, when the price, as sold by the Government, was increased 16 cents per gallon so that the retail price throughout the country is now \$1 per gallon. To this cost must be added 12 cents per gallon, which has to be paid by the holder of a license before he claims his right to purchase fuel. This brings the price up to \$1.12 per gallon, which marks a new high level in England.

Notwithstanding this high price dealers selling gasoline are charging approximately 15 per cent for profit. This bears out the fact that industries are doing everything possible to maintain themselves in sound financial condition, and that no matter how high the price goes the dealer is going to take his profits.

Williams Foundry Reorganized—No Change of Control

AKRON, Sept. 22—The Williams Foundry & Machine Co. has been reorganized and taken over by a new company of the same name, which filed preliminary papers of incorporation Sept. 15. The concern will take over the old Williams Foundry & Machine Co., of this city, and will have a capital stock of \$2,500,000—\$500,000 preferred and \$2,000,000 common stock. Changes have been made to relieve some of the older stockholders from active participation in the company

but the control will remain in the hands of local people as heretofore.

Contrary to reports, the management of the Williams Foundry & Machine Co. will in the future, as in the past, be completely independent of any rubber company. New officers will be: J. K. Williams, president; C. Franz, treasurer; William Leahy, secretary. The above, with Lloyd Williams, manager of the engineering department and a member of the engineering firm of Goethals, Jameson, Houston & Jay, constitute the board of directors. The company now has building plans under consideration and intends a large expansion.

\$3,000,000 Order for Machine Tools

DETROIT, Sept. 24—The United States Government has placed orders for 1000 machine tools costing \$3,000,000 to be installed in manufacturing plants that will build Liberty airplane motors, according to reports from Washington.

World's Copper Production

	Pounds		Pounds
1850.	200,000,000	1911.	1,954,957,560
1860.	260,000,000	1912.	2,259,101,580
1890.	544,000,000	1913.	2,198,732,130
1900.	992,000,000	1914.	2,100,320,000
1910.	1,900,000,000	1915.	2,170,644,000
		1916.	3,136,000,000

World's Production of Copper

2,204 lb.):	1913	1914	1915	1916
United States	556,000	526,000	646,000	881,000
Japan	73,000	73,000	75,000	90,000
Chile	39,000	41,000	47,000	67,000
Mexico	58,000	36,000	31,000	55,000
Canada	35,000	34,000	47,000	53,000
Spain and Portugal	55,000	37,000	*35,000	*50,000
Peru	25,000	24,000	32,006	42,000
Australasia	47,000	38,000	33,000	35,000
Germany	25,000	30,000	*35,000	*35,000
Russia	34,000	32,000	*16,000	*16,000
Total, including countries not specified.....	1,006,000	924,000	1,061,000	1,397,000

*Estimated.

Production of Copper in the United States, 1913, 1914, 1915, 1916

	(Smelter Output, In Pounds Fine)	1913	1914	1915	1916
Alaska	24,423,070	24,985,847	70,695,286	114,000,000	
Arizona	404,278,809	382,449,922	432,467,690	684,000,000	
California	32,492,265	29,784,173	37,658,444		
Colorado	9,052,104	7,316,066	7,272,178		
Idaho	8,711,490	5,875,205	6,217,728		
Maryland		12,248	15,426		
Michigan	155,715,286	158,009,784	238,956,410	269,000,000	
Missouri	576,204	53,519	306,406		
Montana	285,719,918	236,805,845	268,263,040	352,000,000	
Nevada	85,209,536	60,122,904	67,757,322	101,000,000	
New Mexico	50,196,881	64,204,703	62,817,234	30,000,000	
North Carolina	180	19,712	33,383		
Oregon	77,812	5,599	797,471		
Pennsylvania	245,337	422,741			
Tennessee	19,489,654	18,661,112	18,205,308		
Texas	39,008	34,272	38,971		
Utah	148,057,450	160,589,660	175,177,695	232,000,000	
Vermont	5,771		23,995		
Virginia	46,961	17,753	50,008		
Washington	732,742	683,602	903,661		
Wyoming	362,235	17,082	351,871		
Undistributed	51,385	65,479			
Total	1,224,484,098	1,150,137,192	1,388,009,527	1,928,000,000	

U. S. A. Pig Copper Imports in 1917—Fiscal Year.

	Pounds	Pounds
Chile.....	138,000,000	Mexico
Peru	86,000,000	Japan
Canada	79,000,000	

U. S. A. Copper Exports in 1914—Fiscal Year

Germany	311,000,000	France	173,000,000
Netherlands	179,000,000	Great Britain	152,000,000

U. S. A. Copper Exports in 1917—Fiscal Year

France	373,000,000	Russia	92,000,000
Great Britain	305,000,000	Netherlands	5,000,000
Italy	151,000,000		

Fixing Steel Prices Will Not Affect Automobile Industry

Prices Already Established Apply to Steels Largely Needed for Government Ship Building and Munitions—Prices on Alloy Steels Not Determined—More Price Setting to Follow—Detroit Makers Look Favorably on Fixed Prices

WASHINGTON, D. C., Sept. 24—The fixing of certain steel prices by the Government does not as yet seriously, if in any wise, affect steel for automobile use in that the prices fixed refer to those steels that will be most needed by the Government in its great ship-building and ammunition requirements. These steels do not overlap to a great extent with the alloy steels and high carbon steels used in the automobile industry. While prices have not been fixed on the special steels as needed by the automobile manufacturer, the work of price setting is not completed and it is expected that perhaps in the near future price fixing will be settled on those steels finding their way into the automobile.

The Government bulletin covering the new prices is published herewith in the form as issued. The iron ore referred to is what is known as Bessemer Mesaba ore and is the lowest classification. The price of \$5.05 at lower lake ports such as Lake Erie is for a gross ton of 2240 lb. This price is practically the same as iron ore has been selling for, so that the price fixing does not mean anything so far as this is concerned.

The price of pig iron has been considerably reduced and placed at \$33 per ton of 2240 lb. This reduction should perhaps result in cheaper gray iron castings, as the fixed price represents a good reduction over the market, as it has been for some time.

The big government steel requirements appear in the last three items of the fixed price schedule and are designated as steel bars, shapes and plates, all required very extensively in ship construction. It is natural that the price on these should be fixed, as Government purchases will be exceptionally large.

It is rather surprising that no attempt has been made at present to fix the price on steel billets which may be described as semi-finished steel. Undoubtedly price fixing on billets will be taken up in due course later on. The fixing of price on billets would have some effect on the automobile industry, as crankshafts and other forgings are made from them.

Sentiment is general that the steel manufacturers have done their best to co-operate with the Government in the present exigency, and that they have been wholly honest in their endeavors to get the price situation as nearly fair as possible. There has been much discussion tending to the argument for the

Government to take entire control of the steel industry, and the present almost unexpected co-operation of the steel companies leads to the belief that they would not welcome any such action and naturally are disposed to go to the limit in impartial handling of the price question as has been done.

The official Government bulletin issued on the subject follows:

"The President has approved an agreement between the War Industries Board and the steel men fixing the following prices, which become effective immediately, and are subject to revision Jan. 1, 1918:

Commodity and Basis	Price Agreed Upon	Recent Price	Reduction Amount	Reduction Percent
Iron Ore, Lower Lake Ports.....	\$5.05 GT.	\$5.05 GT.	....	..
Coke, Connellsville.....	6.00 NT.	16.00	\$10.00	62.5
Pig Iron.....	33.00 GT.	58.00 GT.	25.00	43.1
Steel Bars, Pittsburgh.....	2.90 Cwt.	5.50 Cwt.	2.60	47.3
Steel Bars, Chicago.....	2.90 Cwt.	5.50 Cwt.	2.60	47.3
Shapes, Pittsburgh.....	3.00 Cwt.	6.00 Cwt.	3.00	50.00
Shapes, Chicago.....	3.00 Cwt.	6.00 Cwt.	3.00	50.00
Plates, Chicago.....	3.25 Cwt.	11.00 Cwt.	7.75	70.5

Note—NT. means net ton 2000 lbs. GT. means gross ton 2240 lbs.

"It was stipulated, first, that there should be no reduction in the present rate of wages; second, that the prices above named should be made to the public and to the Allies, as well as to the Government, and third, that the steel men pledge themselves to exert every effort necessary to keep up the production to the maximum of the past, so long as the war lasts.

"Measures will be taken by the War Industries Board for placing orders and supervising the output of the steel mills in such manner as to facilitate and expedite the requirements of the Government and its Allies for war purposes, and to supply the needs of the public according to their public importance and in the best interest of all, as far as practicable.

"A spirit of co-operation was manifested by the steel men and no doubt is entertained that every effort will be made to bring the production as nearly as possible up to the extraordinary demands resulting from the war."

DETROIT, Sept. 25—The dominant thought emerging from the period of uncertainty caused by the fixing of carbon steel prices at the mills by the Government is that this comes as good news to the automobile manufacturers in this territory. The general feeling is that the Government has dealt quite generously with the steel manufacturers,

and that in doing so the mills can economically produce enough steel to provide the Government with its wants and needs to take care of the other industries. The fact that the prices are high enough to amply compensate the mills for their product, and at the same time high enough to induce a period of conservation in the steel resources of the country, tend to create a healthy situation which should be taken advantage of by both mill and factory alike.

The opinion of men who have made a study of the steel market is that conditions are such that the mills should easily work up to their normal output now with

the price uncertainty cleared away, and that with a fuel supply which is practically guaranteed the only source of uncertainty which remains is the freight car situation. With the Government taking a hand in the price matter, it is normally certain that the matter of distribution of the product will have the same watchful care, and the general feeling is one of relief that the situation has been cleared up.

Two other features which enter into the situation to great advantage in this territory have been the cool summer, which is ideal from the standpoint of the steel mills and which has tended to give an augmented production, and secondly, the conservation tactics which have been followed by manufacturers throughout the country, resulting in greatly reduced scrap piles. This situation is not only true in Detroit and vicinity but is true throughout the country.

One of the Detroit purchasing agents who has recently returned from a three weeks' trip to the East, where he studied very closely the steel conditions existing in other plants, reports that in all cases the scrap piles have been reduced to a considerable extent. Such companies as Billings & Spencer have a scrap pile which is fully 50 per cent less than it was a year ago, and this is true everywhere. The reason for this, of course, is that the prices of steel are now at a

level where it costs less to rework a defective part than it does to scrap it. Automobile concerns here are also careful in scrapping defective products, and instead of throwing such things as broken drills, reamers and cold chisels into the scrap pile they are being salvaged at prices ahead of what was paid for the original tool.

Some doubt is expressed by those familiar with the production of steel as to whether or not the price is equally fair to all the mills. It is pointed out that the larger concerns which operate their own ore carriers and their own mines will have an advantage because of the saving in the freight on the materials necessary for the production of steel, while the smaller and independent concerns will have to stand these expenses and at the same time sell for the same price as the larger concerns sell for. The consensus of opinion, however, is that the price laid down by the Government will take care of all the expenses incurred in the manufacture and leave the mills a suitable profit, even in the cases of smaller companies.

Buyers of the smaller gauge sheet steel, such as is required in the manufacture of bodies, state that the sheet steel used in the automobile industry will probably not be affected by the Government wants, because these run to heavier gauges than those required in the automobile industry. No doubt the plate stock required by the Government will be largely in the nature of armament, shell and ship plating.

The alloy steels do not seem to be affected by the Government rulings in the opinion of representative men in the automobile industry seen here to-day. These men feel that the demand for automobiles is such that the companies making them are going to get the steel by one method or another, and that the Government regulations, instead of making it harder for the companies to get the steel have really cleared the way materially by establishing a definite price at the mill.

Ford Can Fix Prices

SAN FRANCISCO, Sept. 25—The Ford Motor Co., Detroit, is the only one which has a right to use the name Ford in connection with the manufacture and sale of motor cars. According to the United States Circuit Court of Appeals for the Ninth Circuit at San Francisco any one else who uses it will run foul of the law. The case decided was brought by the Ford Motor Co. against Benjamin E. Boone. Until this case is taken before the Supreme Court of the United States, the decision is of considerable importance; the Supreme Court is the only one which can reverse it. The court also has decided that the Ford company is within its rights in compelling its dealers to sign contracts agreeing to sell Ford cars in a restricted territory and at an established price.

Continental Engines on Kelly Trucks

DETROIT, Sept. 21—The Continental Motors Corp. is providing the Kelly-Springfield Truck Co., which, as was recently announced in THE AUTOMOBILE AND AUTOMOTIVE INDUSTRIES, is manufacturing 1200 trucks for the signal corps, with 100 engines for use in these trucks. The trucks will be used for airplane transportation.

Ford's Boston Plant Given to U. S.

BOSTON, Sept. 24—The factory and assembly plant of the Ford Motor Co. at Cambridge, Mass., with available floor-space of approximately 350,000 sq. ft., has been turned over by Henry Ford to the Government for use by the Quartermaster Corps as a depot at this city. The plant will be vacated Oct. 15 and will be used in the establishment of a large depot needed on account of the exigencies of the war situation, that the vast quantity of goods to be shipped to the army here and abroad may have suitable storage.

The capacity of the Boston plant has been 100 cars a day, this being approxi-

mately half the capacity of the Long Island City plant, which serves the metropolitan territory. It is stated that no arrangements have been made to delegate the work of the Boston plant to any other assembly plant. It is possible that New England may be served direct from New York.

PRICE INCREASES

NEW YORK, Sept. 24—Packard, Winton, F. R. P., Jones, Pennsy, Moon have gone up in price, as follows:

Car	Old Price	New Price
Packard 3-25.....	\$3,450	\$3,700
Packard 3-35.....	3,850	4,100
F. R. P.	6,000	7,000
Jones 26-B.....	1,475	1,675
Marmon 34.....	3,050	3,550
Moon	1,000	1,095
Moon 6-45.....	1,395	1,575
Moon 6-66.....	1,750	1,850
Winton 33*.....	2,685	2,950

*Five-Passenger Touring, effective Oct. 15
-\$265 increase on other styles of that model also.

\$5 Increase on Fords

DETROIT, Sept. 21—The Ford Motor Co. has increased the price of Ford cars by \$5 by making an additional charge of \$5 on all cars for delivery. This increase has been made to the dealers who in turn add it to the selling price for the consumers.

Fulton Truck Prices \$130 Higher

NEW YORK, Sept. 25—The Fulton Motor Truck Co. has increased its prices on its trucks \$130, effective Sept. 8. The rise will affect dealers Oct. 10. The new price is \$1,420.

Waukesha Business Shows Increase

WAUKESHA, Wis., Sept. 25—Reports presented at the annual meeting of the Waukesha Motor Co., Waukesha, Wis., showed that the volume of business during the last year amounted to \$2,250,000, a large increase over the previous year. It was predicted that a gain of at least 50 per cent will be shown during the

Fabricated Bakelite Materials

(Continued from page 545)

—0.00002 in. in the direction parallel to the laminations and 0.000085 in. in the direction perpendicular to the laminations.

7. Specific gravity—1.4.
8. Weight per cu. in.—0.05 lb.
9. Shrinkage is practically zero up to a temperature of 100 deg. C.
10. Oil absorption—practically zero.
11. Water absorption—0.25 to 2 per cent by weight, depending on the relative amount of edge surface exposed (with 50 hr. immersion in water at 21 deg. C.).

Working Characteristics

In working this gear material good results with a fine feed have been obtained with a cutting speed of a little over 100 ft. per minute. The cutting tool should have a little rake and in general the material cuts like very hard wood. When cutting straight teeth it is advisable to back up the material with a hard wood blank to prevent fraying of the fabric when the cutter comes through. For cutting helical gears, however, if the cutter is kept sharp and the speed high the backing up plates can usually be dispensed with.

The automobile applications are for camshaft gears, idler gears, for magneto, pump and generator drive and in some cases for the generator pinion. A generator drive with Micarta D gears offers one opportunity to use a high speed generator of small size without danger of undue noise.

The sketches herewith shown in Fig. 1 give suggested methods of mounting camshaft and similar gears on metal centers or hubs. As may be seen gears can be made of this material to substitute directly in place of metal gears without requiring extra width of face for shrouding. A very satisfactory design of a camshaft gear is shown in Fig. 2. Here the gear rim is molded directly onto a metal center so that no rivets or screws or projecting end plates are necessary. The surface of the metal hub is cut with a diamond knurl to insure rigidity between the rim and hub.

One big advantage of this type of construction from the automobile manufacturer's standpoint is that it is supplied with a finished bore and hub. The diameter of the gear rim can be molded to within a few thousandths of the finished size, but ordinarily a light cut is taken to insure absolute concentricity.

new fiscal year, as the works have been doubled in size and capacity within the past 12 months and at present the output is 50 motors a day. Stockholders re-elected all directors, who in turn re-elected officers as follows: President, C. A. Haertel; vice-president, E. R. Estberg; secretary and general manager, Harry M. Horning; treasurer, S. A. Perkins.

Curtiss Gets War Contract

BUFFALO, N. Y., Sept. 24—The Curtiss Aeroplane & Motor Corp. has closed with the Government for war contracts, thus putting all of its plants in this city at capacity work until the termination of the war.

Nov. 15 was the date upon which the big new plant here was to be completed for full operations. It is now stated that the company will be in a position to go ahead with the production of airplanes in most of this plant considerably in advance of that date, at least by Nov. 1, and perhaps by the middle of October.

Curtiss has already paid out more than \$1,000,000 on building contracts aggregating about \$4,000,000. Its new plant has been financed and its full requirements for working capital are provided.

It is understood that the original order for 4500 Curtiss engines placed with the Willys-Overland Co. early in the summer is now in production and has been increased.

Although the size of the Government order for airplanes is not known, it is stated that things have been satisfactorily arranged for the Curtiss company, notwithstanding the vigorous pressure of claims upon the Administration for the location of plants for the production of airplanes in other parts of the country.

Sharp Advance in Stocks

Based on Durant's Statement on Heavy Business—Shorts Driven to Cover

NEW YORK, Sept. 25—The pronounced declines in automotive stocks during the past couple of months, have been checked for the time being as a result of the favorable impression of W. C. Durant's statement of the financial condition of General Motors. There was good buying in this stock from the opening on Wednesday. Mr. Durant's statement came in the nature of a surprise to many persons in the financial district who had entertained somewhat different views. This was indicated in heavy covering of shorts in the motors, as it suggested that the automotive industry was in a stronger position than assumed in various quarters.

The big declines up to last week had created more than usual interest in the affairs of the automobile companies of the country. General Motors was the last of the motor stocks to sustain heavy declines in quotation, the present level comparing with close to 150 for the stock earlier in the current year. Saxon Motor has declined over 50 points since the beginning of 1917 and over 70 points from the top of 1916. Maxwell Motor has sustained a drop of about 30 points from the high of this year and almost 70 points from that of 1916. Chevrolet Motor, which in 1916 sold at 278 and at 146 early this year, is now quoted around 77.

Last week saw very few declines in automotive issues. Chevrolet, General

Motors, Chandler, Maxwell, United Motors, and Willys-Overland, all made substantial gains of from a fraction to 9 points.

\$500,000 for Scripps-Booth

DETROIT, Sept. 24—At a meeting of the Scripps-Booth Corp. held recently, stockholders voted to increase the stock issue by an amount which will add \$500,000 to the resources of the company. They have agreed to take the additional stock issue under the condition that present creditors will permit the extension of the obligations over a period of 15 months. The additional capital is to be paid into the business and will be used to discount current bills.

DIVIDENDS DECLARED

Motor Products Corp., quarterly of \$1 a share, payable Oct. 1 to stock of record Sept. 22.

Hendee Mfg. Co., quarterly of 1 1/4 per cent on preferred, payable Oct. 1.

Hupp Motor Car Co., quarterly of 1 1/4 per cent on preferred, payable Oct. 1 to stock of record Sept. 20.

Keystone Tire & Rubber Co., quarterly of 2 per cent, with additional 1/3 per cent upon preferred, and regular quarterly of 3 per cent upon common, payable Oct. 1, 1917, to stock of record Sept. 21.

Wire Wheel Corp. of America, semi-annual dividend of 4 per cent on preferred, payable Oct. 1 to stock of record Sept. 21.

Automobile Securities Quotations on the New York and Detroit Exchanges

	Bid	Asked	Net Ch'ge	Bid	Asked	Net Ch'ge			
*Ajax Rubber Co.	60	62	- 1/4	Springfield Body Corp. com.	..	..	..
*J. I. Case T. M. Co. pfd.	..	82	+ 1/2	Springfield Body Corp. pfd.	8 1/4	9 1/4	+ 1/4		
Chalmers Motor Co. com.	3	7	- 2	Standard Motor Construction Co.	58	59	+ 1/4		
Chalmers Motor Co. pfd.	..	..	..	*Stewart-Warner Speed. Corp.	47	47 1/2	+ 1/4
*Chandler Motor Co.	76 1/2	78	+ 1/2	*Studebaker Corp. com.	..	96	..		
Chevrolet Motor Co.	77	80	+ 1/2	*Studebaker Corp. pfd.	..	19	19		
Curtiss Aero.	42	42	+ 2 1/2	Submarine Boat.	..	..	..
*Fisher Body Corp. com.	30	35	- 7	Swinchard Tire & Rubber Co.	..	..	..
*Fisher Body Corp. pfd.	84	87	- 1 1/4	United Motors Corp.	20 1/4	20 3/4	+ 2 1/4		
Fisk Rubber Co. com.	63	67	..	*U. S. Rubber Co. com.	59 1/2	60 1/2	+ 1/4		
Fish Rubber Co. 1st pfd.	102	104	..	*U. S. Rubber Co. pfd.	103 1/2	104 1/2	+ 1/2		
Fish Rubber Co. 2nd pfd.	96	103	..	*White Motor Co.	43	45	..		
Firestone Tire & Rubber Co. com.	114 1/2	116 1/2	- 1/2	*Willys-Overland Co. com.	27 1/4	28 1/4	+ 1/4		
Firestone Tire & Rubber Co. pfd.	102	104	- 1/2	*Willys-Overland Co. pfd.	87 1/4	95	+ 1/4		
*General Motors Co. com.	98	99 1/2	+ 5 1/4	Wright-Martin ..	8 1/2	9	+ 1/4		
*General Motors Co. pfd.	82	83	+ 1	*At close September 24, 1917. Listed New York Stock Exchange.					
*B. F. Goodrich Co. com.	45 1/4	45 1/2	+ 1 1/4	OFFICIAL QUOTATIONS OF THE DETROIT STOCK EXCHANGE					
*B. F. Goodrich Co. pfd.	100	102 1/2	- 1	ACTIVE STOCKS					
Goodyear Tire & Rubber Co. com.	188	190	- 1	INACTIVE STOCKS					
Goodyear Tire & Rubber Co. pfd.	102 1/2	104 1/2	- 1/2	Auto Body Co.	..	11 1/2	..		
Grant Motor Car Corp.	2 1/2	3 1/2	+ 1/2	Bower Roller Bearing Co.	29 1/2	29 1/2	+ 1/2		
Hendee Mfg.	20	30	..	Chevrolet Motor Co.	74	79	+ 5		
Hupp Motor Car Corp. com.	2 1/4	3 1/4	+ 1/4	Commerce Motor Car Co.	..	10	..		
Hupp Motor Car Corp. pfd.	82	88	+ 2	Continental Motor Co. com.	6	6 1/2	+ 1/4		
International Motor Co. com.	11	12	+ 1	Continental Motor Co. pfd.	..	..	..
International Motor Co. 1st pfd.	..	..	..	Edmunds & Jones com.	..	35	..
International Motor Co. 2nd pfd.	15	30	..	Ford Motor Co. of Canada.	210	220	..		
*Kelly-Springfield Tire Co. com.	42 1/2	45	+ 1/2	Hall Lamp Co.	..	13	..		
*Kelly-Springfield Tire Co. 1st pfd.	85	95	..	Michigan Stamping Co. com.	..	..	..
*Lee Rubber & Tire Corp.	17 1/2	18 1/2	+ 3/4	Motor Products	..	..	..
*Maxwell Motor Co., Inc. com.	34 1/2	34 1/2	+ 3 1/2	Packard Motor Car Co. com.	..	148	..		
*Maxwell Motor Co., Inc. 1st pfd.	65	66 1/2	+ 1 1/2	Packard Motor Car Co. pfd.	..	97	..		
*Maxwell Motor Co., Inc. 2nd pfd.	20 1/2	20 3/4	..	Paige-Detroit Motor Car Co.	..	24 1/2	..		
Miller Rubber Co. com.	175	180	- 5	Prudden Wheel Co.	..	20	..		
Miller Rubber Co. pfd.	100	103	- 1	Reo Motor Car Co.	..	26 1/2	+ 3 1/2		
Packard Motor Car Co. com.	145	155	..	INACTIVE STOCKS					
Packard Motor Car Co. pfd.	96	98	..	Atlas Drop Forge.	..	35 1/2	..		
Paige-Detroit Motor Car Co.	24	26	..	Kelsey Wheel Co.	82	..	..
Peerless Truck & Motor Corp.	13	15	..	Regal Motor Car Co.	..	26 1/2	..		
Portage Rubber Co. com.	120	130	- 5	INACTIVE STOCKS					
Regal Motor Car Co. pfd.	15	20	..	..	..	..	..
Reo Motor Car Co.	25	26 1/2	- 1/2	..	..	..	..
*Saxon Motor Car Corp.	13	14	- 1/2	..	..	..	..

New Companies

MUSKOGEE, OKLA., Sept. 24—The Oklahoma Auto Mfg. Co. has been organized in Muskogee, Okla., to manufacture the O K motor truck at \$1,295. The company is capitalized for \$1,000,000 and is selling its stock for \$10 per share, which is the par value. Officers of the company include: W. R. Lantz, president, who is also the head of the Lantz Auto & Carriage Works; C. E. Harris, president of the Dixie Oil & Gas Co., first vice-president; E. J. Dunigan, president of the Muskogee Tool Works, second vice-president; W. G. Gibbons, treasurer of the Chestnut-Gibbons Wholesale Grocery Co., secretary; A. C. Trumbo, president of the Muskogee National Bank, treasurer. The company is said to be installing equipment now and expects to be in production in the near future. Specifications of the truck include a Lycoming, four-cylinder cast en bloc, bore 3½ by 5 motor, multiple disc clutch, selective sliding gear transmission with center control, drop forged I-beam front axle, worm gear type rear axle, Detroit steel product springs, artillery type wheels, a work and gear type left-hand drive steering gear, 4 17/32 channel steel frame, Carter special carburetor, electric light and starting system with Delco ignition.

CLEVELAND, Sept. 21—The Standard Steel Castings Co. has entered the cast steel wheel field for automobiles. A large plant will be built and will have a capacity of 400 wheels a day. A 20-acre tract of land at East Seventy-first Street and the Belt Line Railway will be used for the new plant. The machine department, now located in Morgan Avenue, will be moved to the new site, but the West Side plant is to be continued for the manufacture of miscellaneous castings, principally automobile work.

The company, which recently increased its capital to \$1,000,000, is officered by the following men: Julius F. Janes, president; E. H. Janes, vice-president and treasurer, and W. R. McDonough, secretary and general manager.

INDIANAPOLIS, IND., Sept. 22—Incorporation papers have been issued to the Jenkins Vulcan Spring Co., Richmond, Ind., the new company, which recently was moved to Richmond from the East, having a capitalization of \$500,000. The company will manufacture automobile springs. The directors are: Thomas B. Jenkins, Edwin Schiele, Robert G. Zettner, John M. Lontz, George E. Seidel, Samuel E. Swayne and James A. Carr. A large manufacturing plant at Richmond is being remodelled to meet the company's needs.

SEATTLE, Sept. 21—The United States Attachment Co., Inc., has been organized here to manufacture a device which will burn distillate instead of gasoline in automobiles. It was invented by T. A.

Rhodimer, of Seattle. The officers of the new company are as follows: R. V. Ankeny, president; E. C. Phillips, vice-president, and James Armstrong, secretary and treasurer.

The device being used by Rhodimer is very simple and consists of a small copper pipe which takes the water from the overflow of the radiator through a vacuum and connects it up with the carburetor through the air intake. As the water vaporizes and mixes with the distillate it forms a perfect combustion in the chamber of the motor, and from the statement of local mechanics the saving is positive from the standpoint of fuel. The new device prevents carbon accumulating in the cylinder of the engine and thereby gives more power and speed to the engine.

WATERTOWN, WIS., Sept. 24—The National Paper Glass Co., organized recently at Watertown, Wis., with a capital stock of \$100,000, has commenced operations in its new plant in First Street, and for the present will operate one machine on two 8-hr. shifts, with a capacity of 6000 sheets, 24 by 50 in., a day. By the end of the year four additional machines will be installed and the output increased to 75,000 sheets a day. It will be one of the first industries of this kind to manufacture a paper glass sheet suitable for head-light lenses, windshields, windows and other uses in cars. The officers of the company, which is exclusively a Watertown enterprise, are: President, W. C. Stone; vice-president, Jesse Stone; secretary-treasurer, T. B. Cowen; chief chemist and engineer, J. A. Hacker.

ST. CATHARINES, ONT., Sept. 23—The Normandy Tire Co., Limited, has been incorporated under the Dominion Companies Act with an authorized capital of \$1,000,000 divided into 1,000,000 shares at \$1 each. The officers and the board of directors of the company are as follows: John Shultz, Port Colborne, Ont., president; Alfred M. Ecclestone, vice-president; Samuel Inksater, secretary-treasurer; Harvey Obee, Albert J. Gilmore, Albert Cox, John More, Isaac Normandy, John Morton, and W. S. H. Swazie, directors. With a view to establishing manufacturing facilities the company has acquired a site at St. Catharines, Ont., comprising a block of land 150 ft. by 525 ft., and containing a building 50 by 150 ft. With the progress of the company this plant will be considerably enlarged. The company has acquired the rights for the whole of the Dominion of Canada to manufacture this punctureless tire with the exception of the Maritime Provinces.

COLUMBUS, OHIO, Sept. 22—The Freeman tractor with four wheels in which a form engine is used and which is designed to pull two plows and other farm implements will be manufactured in this city by a corporation about to be formed

with a capital of \$100,000. The tractor is the invention of J. W. Freeman of Peebles. A working model of the tractor has been completed and demonstrated.

BARRIE, ONT., Sept. 23—The Barrie Carriage Company, Limited, Barrie, Ontario, is numbered as one of the last carriage manufacturing concerns in Canada to take up the production of automobiles on an extensive scale. This company has entered upon its second year in the car business and, according to Manager J. B. Barr, the volume of production for 1918 will be 1200 cars. It is also continuing with the manufacture of horse-drawn vehicles. The car made by this concern is known as the Bell and various parts are imported from the United States.

The company has been appointing distributors and agents throughout Canada from Halifax to Calgary.

Monitor Co. Will Erect Plant

COLUMBUS, Sept. 20—Having purchased land at the corner of Third Avenue and Factory Street, the Monitor Motor Car Co. will erect a plant of 10,000 sq. ft. floor space and begin the manufacture of cars in it next year. A production of 3000 to 3500 cars is contemplated for 1918. At present about twelve cars are being turned out per week. These comprise both four-cylinder and six-cylinder models, of 110 and 117 in. wheelbase respectively.

Three body styles are mounted on these chassis—a victoria at \$1,395 for the six-cylinder and \$1,195 for the four-cylinder model; a four-passenger roadster at \$1,195 for the six-cylinder and \$995 for the four-cylinder model, and a five-passenger touring at \$1,195 for the six-cylinder and \$995 for the four-cylinder model. In November a sedan is to be added to the line, but otherwise there will be only a few minor changes in the product for the 1918 season.

Standard parts are used throughout these cars. The six-cylinder model has a Continental engine, the Red Seal 7-W, and the four-cylinder model a Golden, Belknap & Swartz. Grant-Lees gearsets and Brown-Lipe differentials are used.

Flanged Wheels To Solve Shipping Problem

LOUISVILLE, KY., Sept. 23—Lee Miles, president of the Southern Motors Co., this city, has evolved a plan for shipping automobiles from the factory to the dealer under their own power over the railroad tracks. At the factory, after the final inspection, the demountable rims and tires are to be removed from the cars, flanged wheels fitted and the cars then sent to their destination under their own power in trains of from twenty-five to fifty over the railroad rights of way. Mr. Miles believes that this will help to solve the nation's transportation problems.

Personals

C. F. Johnson has been appointed carburetor engineer for the Johnson Co., Detroit. Mr. Johnson was formerly the carburetor engineer for the Cadillac company, with which he was connected for 12 years, during which time he played an important part in the development of Cadillac carburetors.

A. B. Browne, consulting engineer, New York, inventor of the Browne carburetor and part inventor of the Browne-Chase engine, has been commissioned captain in the medical corps, where he will be an inspector of ambulances.

E. J. Cook has been placed in charge of the engineering department of the Engineering & Sales Corporation, Chicago. He will handle exclusively the design of trucks and tractors.

R. P. Pennock has been appointed inspector of airplanes, airplane engines and signal service at large for the Government.

Roy S. Davey, advertising manager of the Chalmers Motor Co., Detroit, has resigned to become assistant sales manager of the Bethlehem Motors Corp., Allentown, Pa.

Benton G. L. Dodge has become advertising manager of the Standard Parts Co., Cleveland.

George L. Lavry, Jr., formerly manager of service stations for the Springfield Body Co., Detroit, has been commissioned lieutenant in the motor section of the Ordnance Department.

Brock Mathewson, who was formerly in the advertising field of the automobile industry, has joined the sales forces of the Hawthorn Mfg. Co., Detroit.

W. H. Kirkpatrick, who for many years was general sales manager for the Peerless Motor Car Co. at Cleveland, is now in Washington, where he will manufacture an article for war purposes under contract with the Government.

W. A. Booth has been appointed manager of the Detroit office of the Standard Steel Tube Co. of Toledo.

C. B. Rose, vice-president of the Velie Motors Corp., and for many years chief engineer of the company, will serve in the inspection bureau of the aviation department in Washington.

William C. Little, western sales representative of the Bearings Co. of America, of Lancaster, Pa., has moved his office during the present week from 604 Ford Building to a larger office at 1012 Ford Building, Detroit, Mich.

John H. Lemmon has been appointed advertising manager of the Sterling Mo-

tor Truck Co., Milwaukee. He has been connected in Chicago with the Watrous-Esteys Advertising Co., the Macavoy Advertising Co., and more recently with Nichols-Finn Advertising Co.

was connected for 6 years. The western division of which Mr. Martin will have charge includes all of the territory west of Denver and part of Texas.

F. P. Soper, manager of the order department for the Federal Motor Truck Co., Detroit, has been promoted to become assistant sales manager. E. W. Winans, who was formerly chief engineer for the Regal Motor Car Co., has been appointed service manager for the Federal company.

A. B. Walton, sales manager of the Master Carburetor Corp., Detroit, has tendered his resignation to take effect Oct. 1.

H. J. Flint, sales manager of the J. C. Wilson Co., Detroit, truck maker, has resigned to take effect Oct. 1.

A. C. Woodbury, recorder of the Society of Automotive Engineers Standards Committee, who resigned last week, has joined the engineering department of the Duesenberg Motors Corp., Elizabeth, N. J.

ELECTIONS

DETROIT, Sept. 24—Carl Heim, president and treasurer of the United Engineering Co. of Chicago, has been elected a director of the Air-O-Flex Automobile Corp., this city.

NEW YORK, Sept. 26—Jacques S. Cohen of J. S. Bache & Co., Henry E. Butler of Charles D. Barney & Co., and Sherwood E. Hall of Hornblower, Miller, Garrison & Potter, have been elected directors of the Chalmers Motor Co. and the Chalmers Motor Corp.

PLYMOUTH, Wis., Sept. 24—The Plymouth Motor Mfg. Co., formerly the Steiner Mfg. Co., Plymouth, Wis., manufacturer of portable and stationary gas engines, has completed its reorganization by the election of these officers: president, George W. Brickbauer; vice-president, H. J. Goelzer; secretary, Gustave W. Schiereck; treasurer, E. M. D. Korte. The company intends to enlarge its line of products to include motive units for tractors and other heavy duty machines.

Westlake, Newspaper Veteran, Dead

CHICAGO, Sept. 20—one of the best known newspaper men connected with the automobile industry in the Middle West was lost to the industry by the death of Edward G. Westlake, who for 27 years had been connected with the Chicago Evening Post. Eddie Westlake was not only well known to the industry but was one of the optimists who had great faith in it. He died of acute kidney trouble at his home last evening. He was 49 years old. He attempted to keep in close touch with the industry.

Factory

Hendee Working Overtime—Wire Wheel Stock Offered to Members

SPRINGFIELD, MASS., Sept. 25—Reports to the effect that the Hendee Mfg. Co., the largest motorcycle manufacturer in the country, was to discontinue manufacture, are entirely misleading and apparently based on the fact that last spring this company sold to the Wire Wheel Corp. of America a small factory that had been used for manufacturing drop forgings, springs, etc., the Hendee company deciding that it could purchase these to better advantage than it could manufacture them. The current rumor seems to have been circulated because of a letter sent by the Hendee Mfg. Co. to its stockholders advising them that they had stock in the Wire Wheel Corp. of America which had been taken in payment for the small plant sold, and that this stock was offered to whatever stockholders desired it. It was this letter which led to the false rumor. At present the Hendee Mfg. Co. is working overtime with a force of 1800 men on the manufacture of its motorcycles, and Oscar Hedstrom, director and engineer, is devoting his entire energy to the work.

F. J. Weschler, treasurer of the Hendee company, has been authorized to give one share of the Wire Wheel Corp. preferred and one share of common for each preferred share of the stock of the Hendee Mfg. Co.

Net earnings of the Wire Wheel Corp. of America for the first 5 months of the present fiscal year, namely, from April 1 to Aug. 31, are estimated at \$470,000. This is at an annual rate of about \$1,128,000. The present capacity of the Houk wire wheel plant and the Springfield plant acquired is between 4000 and 5000 wheels a day.

Republic Brass to Add

PONTIAC, MICH., Sept. 22—The Republic Brass & Bronze Co., which, as was recently stated in an issue of AUTOMOTIVE INDUSTRIES, is now controlled by the Precision Die Casting Co., Syracuse, N. Y., will erect additions to its plant and employ more men to take care of new Government contracts recently secured.

Fisher Adds One-Story Plant

DETROIT, Sept. 22—The Fisher Body Corp. will erect a one-story brick and steel factory building adjoining its present plant.

Panhard Truck Maker Expanding

GRAND HAVEN, MICH., Sept. 22—The Hamilton Motor Co. is adding to its working organization to take care of increasing business. The company produces the Panhard truck, which is equipped with Gray engine, Prefex radiator, Torbensen axles, Auto-Lite system, Willard batteries, Firestone tires, Stew-

art-Warner vacuum system, Fuller transmission, Lavine steering gear and Panhard cabs and bodies. The chassis sells for \$795.

Moon Takes Over Buggy Works

ST. LOUIS, Mo., Sept. 24—The Moon Motor Car Co. has taken over as a part of its plant the works of the Joseph W. Moon Buggy Co., which makes the motor plant cover the entire block, including factory buildings recently acquired. The additional factory space and machinery being installed insure the completion of 20,000 of the new "Thousand Dollar Six" model.

Eastern Office for Young Ovens

NEW YORK, Sept. 21—Young ovens for japanning and drying purposes will be handled in the Eastern district by the Bradford-Ackermann Corp., which will cover the New England States, New York, New Jersey, Maryland, Delaware, and eastern Pennsylvania. An engineering department will likewise be available for manufacturers in the East.

New \$500,000 Plant for Ireland & Mathews

DETROIT, Sept. 24—The Ireland & Mathews Co., manufacturer of automobile parts, has completed its new \$500,000 factory which it was obliged to build because of its increasing business.

American Trimming Co. for Cleveland

CLEVELAND, Sept. 22—The American Auto Trimming Co., Detroit, has purchased 2 acres of land in this city as a site for a large factory building.

Five Wright-Martin Motors Daily

DAYTON, OHIO, Sept. 25—The Wright-Martin Aircraft Corp. is gradually increasing its airplane motor production. During August the output was sixty-five motors, an average of three per day. Early in September the output has been at the rate of five motors per day.

Propeller Maker Moves to Grand Rapids

GRAND RAPIDS, MICH., Sept. 22—The Flottorp Mfg. Co. of Chicago, a concern which manufactures airplane propellers, will move to this city. The company will operate a large plant here and expects to turn out 100 propellers a day within the next 30 days. The company has been established for 6 years in Chicago. O. Flottorp is president, W. H. Gardner is vice-president and treasurer.

Two New Buildings for Duplex

LANSING, MICH., Sept. 24—The Duplex Truck Co. has a schedule providing for 300 trucks per month during 1918 and is erecting two factory buildings with 100,000 sq. ft. of floor space to provide additional manufacturing facilities.

Standard Crucible Again Adds

MILWAUKEE, WIS., Sept. 22—The Standard Crucible Steel Castings Co. has awarded contracts for a second foundry addition this year. The capacity is being increased 75 per cent, or a total of 150 per cent since a year ago.

Appleton Body Breaks Ground

APPLETON, WIS., Sept. 24—Ground has been broken for the new motor car, truck and closed body manufacturing plant of the Appleton Auto Body Mfg. Co. at Spencer Street and Pierce Avenue. The company will spend about \$20,000 in the erection of buildings and wood and metal-working equipment.

40 Elgins Per Day

CHICAGO, ILL., Sept. 21—The Elgin Motor Car Corp. is increasing its output and now produces an average of forty cars per day. During the month of August the company produced 806 cars, more than the entire season's output of last year. The highest record for a single day's output was fifty-three cars. In order to meet the demand the company is building a large addition to its factory which will increase the production to 100 cars per day. Construction work has started on the new building.

Guynemer, French Aviator Hero, Dead

NEW YORK, Sept. 26—Captain Georges Guynemer, the world's greatest aviator, is reported dead. It is supposed he met his death in a fight with more than forty enemy airplanes in a reconnaissance flight over Flanders on which he left Dunkirk on Sept. 11. Since then nothing has been heard of him.

Captain Guynemer, who has earned world-wide fame by his exploits over the enemy lines was undoubtedly the most brilliant aviator the war has developed. A mere lad, not yet 23 years old, he had surpassed the best efforts of every other aviator and become a terror to the enemy. On Sept. 10 he was cited in the official French announcement as having brought down his fiftieth enemy plane and in an unofficial report a few days later was credited with fifty-two.

Draftsmen in Demand

DETROIT, Sept. 24—There is a demand for draftsmen in many factories caused by the large number of draftsmen who have enlisted in Government work. The companies are seeking draftsmen who are not liable to be called upon by the War Department.

Pennsylvania Rubber Opens Club

JEANNETTE, PA., Sept. 21—The Pennsylvania Rubber Co. opened the new Wayfarer's Club at the recent annual conference of branch managers and sales directors. Situated near the factory, the club is mainly used for the discussion

of business and social activities. There is a dining room, living room, kitchen, billiard room, card room, etc.

Selden Sales Conference Oct. 1

ROCHESTER, N. Y., Sept. 21—The annual sales conference of division sales managers of the Selden Truck Sales Co. has been called for the week of Oct. 1.

A recent report made to the directors of the Selden company shows an increase of more than 387 per cent in domestic agency representation during the last year.

Silver Takes Over Kissel

NEW YORK, Sept. 24—Following the shake-up in dealers' circles, which was told of in THE AUTOMOBILE AND AUTOMOTIVE INDUSTRIES last week, and which involved the Cole and Kissel, the information has been permitted to become public that it is the C. T. Silver Motor

Co. which takes over the Kissel distribution.

Landover Starts Production Oct. 1

MARINETTE, WIS., Sept. 24—The Landover Motor Truck Co., Chicago, is completing the removal of its works and offices from Chicago to Marinette, and the new plant will be in full operation by Oct. 1. The company, with the assistance of local capital, has taken a 3-year lease on the former Marinette Iron Works plant, with an option to purchase at the end of a year. A. L. Washburn has been elected a director to represent local interests, which will amount to about \$20,000. James Shaw, designer of the Landover truck, will be general manager of the new Marinette plant.

Bodies Coming from Milwaukee

MILWAUKEE, Sept. 23—The American Auto Body Co., of Milwaukee, which was incorporated recently with \$50,000 cap-

ital to manufacture passenger and commercial car bodies, winter tops, etc., is preparing to build a complete manufacturing unit in Milwaukee during the coming fall. Plans contemplate a fire-proof building 200 by 300. Offices have been established at 531 Caswell block, in charge of David J. Borun, treasurer.

\$51,000,000 Unfilled Orders for Westinghouse

PITTSBURGH, PA., Sept. 22—The Westinghouse Electric & Mfg. Co. will pay off out of cash in the treasury on Oct. 1 the \$2,720,000 5 per cent collateral notes maturing on that date. The company in its current fiscal year, which began April 1, bids fair to have the biggest period in its history. Unfilled orders on hand Aug. 1 for regular line of work exclusive of war orders amounted to \$51,000,000. Government work if included would raise the total of unfilled orders considerably.

Calendar

ASSOCIATIONS

Oct. 9-11—Pittsburgh National Assn. of Purchasing Agts. Convention.

Oct. 9-11—Chicago, National Federation of Implement and Vehicle Dealers' Assn., 18th Annual Convention, Hotel Sherman.

1918

Jan. 3-4—New York, Automotive Electric Assn., meeting.

CONTESTS

Sept. 28—Trenton, N. J., Track Race.
Oct. 6—Danbury, Conn., Track Race.
Oct. 6—Uniontown, Pa., Speedway Race.
Oct. 11-12-13—Chicago, Master Driver contest.
Oct. 13—Richmond, Va., Track Race.
Oct. 13—Chicago Speedway Race.
Oct. 27—New York Speedway Race.
Oct. 24—Columbus, Ohio, Dixie Highway tour.

SHOWS

Oct. 1-6—Buffalo, N. Y., Closed Car Show, Automobile Dealers' Assn., Elmwood Music Hall.
Oct. 1-13—Wichita, Kan., Show.
Oct. 6-13—Boston, Closed Car Show, Boston Automobile Dealers' Assn.
Oct. 6-13—Cincinnati Automobile Show, Music Hall, Cincinnati Automobile Dealers' Assn.
Oct. 10-17—New York, Electrical Exposition, Grand Central Palace.
Oct. 13-20—Atlanta, Ga., Atlanta Automobile Association, J. W. Ranshaw, Mgr.
Oct. 13-28—Dallas, Tex., Dallas Automobile & Accessory Dealers' Assn., State Fair.
Nov. 5-10—Los Angeles, Cal., Motor Car Dealers' Assn., Billy Sunday Tabernacle, J. S. Conwell, Mgr.
Nov. 12-18—Denver, Colo., Show, Auditorium, Automobile Trades Assn. of Colorado.

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Jan. 5-12—New York Show, Grand Central Palace, National Automobile Chamber of Commerce.
Jan. 19-26—New York, Motor Boat Show, Grand Central Palace, National Assn. of Engine and Boat Manufacturers.
Jan. 19-26—Montreal, Show, National Motor Show of Eastern Canada, Montreal Automobile Trade Assn.
Jan. 19-28—Montreal, Can., Montreal Automobile Trade Assn., Ltd., Almya Bldg., T. C. Kirby, Mgr.
Jan. 26-Feb. 2—Chicago National Show, Coliseum and Armory, National Automobile Chamber of Commerce.
Feb. 11-16—St. Louis, Mo., St. Louis Auto Mfrs. & Dealers' Assn., Robert E. Lee, Mgr.
Feb. 18-23—Newark, N. J., N. J. Auto Exhibition, Co. G, First Regiment Armory, Claude E. Holgate, Mgr.

Feb. 18-23—Des Moines, Ia., Des Moines Automobile Dealers' Assn., Coliseum, C. G. Van Vliet & Dean Schooler, Mfrs.

Feb. 18-25—Pittsfield, Mass., State Guard, State Armory, James J. Callagan, Mgr.

Feb. 18-27—So. Bethlehem, Pa., Fourth Annual, (cars 18-23; trucks 25-27), Coliseum, J. L. Elliot, Mgr.

S. A. E. Calendar

Standard Division Meetings

October

- 3—Miscellaneous, Detroit.
- 4—Lighting, Detroit.
- 5—Miscellaneous, Congress Hotel, Chicago.
- 6—Tractor, Congress Hotel, Chicago.

Engineering

American Railway Master Mechanics' Assn.

American Institute of Electrical Engineers.

Master Builders' Assn.

American Society of Heating and Ventilating Engineers.

Association Iron and Steel Electrical Engineers.

Mining and Metallurgical Society of America.

Society of Automotive Engineers.

OCTOBER

- 4—Assn. Iron & Steel Elec. Engrs. monthly meeting Phila. section.
- 8—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Ill. section at Chicago.
- 9—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Mich. section at Detroit.
- 10—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Mass. section at Boston.
- 11—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Penn. section at Phila.
- 13—Assn. Iron & Steel Elec. Engrs. monthly meeting Cleveland section.
- 15—Amer. Soc. Heat. & Vent. Engrs. monthly meeting New York section.
- 17-18-19—Amer. Gas. Inst. at Washington, D. C.

18—Mining & Met. Soc. Amer. monthly meeting New York section Engrs. Club.

20—Assn. Iron & Steel Elec. Engrs. monthly meeting Pittsburgh section.

NOVEMBER

3—Assn. Iron & Steel Elec. Engrs. monthly meeting Phila. section.

8—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Penn. section at Phila.

9—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Ohio section at Cleveland.

10—Assn. Iron & Steel Elec. Engrs. monthly meeting Cleveland section.

12—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Ill. section at Chicago.

Illuminating Engineering Society.

National Electric Light Assn.

National Gas Engine Assn.

American Society for Testing Materials.

American Institute of Metals.

American Foundrymen's Assn.

Society Naval Architecture and Marine Engineers.

12—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Mich. section at Detroit.

13—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Mass. section at Boston.

15—Mining & Met. Soc. Amer. monthly meeting New York section at Engrs. Club.

15-16—Soc. Naval Arch. & Marine Engrs. annual meeting Penn. section at Phila.

17—Assn. Iron & Steel Elec. Engrs. monthly meeting Pittsburgh section.

19—Amer. Soc. Heat. & Vent. Engrs. monthly meeting New York section.

DECEMBER

1—Assn. Iron & Steel Elec. Engrs. monthly meeting Phila. section.

8—Assn. Iron & Steel Elec. Engrs. monthly meeting Cleveland section.

10—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Ill. section at Chicago.

11—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Mich. section at Detroit.

13—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Penn. section at Phila.

13—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Ohio section at Cleveland.

15—Assn. Iron & Steel Elec. Engrs. monthly meeting Pittsburgh section.

17—Amer. Soc. Heat. & Vent. Engrs. monthly meeting New York section.

20—Mining & Met. Soc. Amer. Monthly meeting New York section at Engrs. Club.